

NAVAL POSTGRADUATE SCHOOL

Monterey, California



THESIS

**A COMPREHENSIVE ANALYSIS OF THE
ENVIRONMENTAL REMEDIATION INDUSTRY**

by

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June 2000

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20001117 019

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instruction, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188) Washington DC 20503.

1. AGENCY USE ONLY (Leave blank)	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED	
	June 2000	Master's Thesis	
4. TITLE AND SUBTITLE A COMPREHENSIVE ANALYSIS OF THE ENVIRONMENTAL REMEDIATION INDUSTRY		5. FUNDING NUMBERS	
6. AUTHOR(S) Hill, Ronald E. Sr.			
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Naval Postgraduate School Monterey, CA 93943-5000		8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)		10. SPONSORING / MONITORING AGENCY REPORT NUMBER	
11. SUPPLEMENTARY NOTES The views expressed in this thesis are those of the author and do not reflect the official policy or position of the Department of Defense or the U.S. Government.			
12a. DISTRIBUTION / AVAILABILITY STATEMENT Approved for public release; distribution is unlimited.		12b. DISTRIBUTION CODE	
13. ABSTRACT (Maximum 200 words) As a result of the legislation enacted over the past 20 years, American Government and industry are currently spending about \$115 billion a year to meet environmental goals. This amount is expected to increase to \$160 billion a year by the end of the year 2000. State and local Governments, which will have to bear a particularly large share of this increase, face over \$80 billion in investment costs for wastewater alone, and the Federal Government will have to spend about \$200 billion simply to clean up contaminated Department of Defense and Department of Energy installations. Altogether, the nation has invested about \$1 trillion in environmental protection over the last 20 years. This analysis was designed to find out whom the DoD does business with in the Environmental Remediation Industry. Key findings of this study are (1) Environmental Remediation Companies are not dependent on the DoD business for survival, (2) Small Businesses dominate the Environmental Remediation Industry, (3) A majority of the Environmental Remediation companies provide services versus goods, (4) Environmental Remediation companies are located in states with strict environmental laws.			
14. SUBJECT TERMS Environmental Remediation Industry, Industrial base, Small Business, Contract Administration		15. NUMBER OF PAGES 169	
16. PRICE CODE			
17. SECURITY CLASSIFICATION OF REPORT Unclassified	18. SECURITY CLASSIFICATION OF THIS PAGE Unclassified	19. SECURITY CLASSIFICATION OF ABSTRACT Unclassified	20. LIMITATION OF ABSTRACT UL

NSN 7540-01-280-5500

Standard Form 298 (Rev. 2-89)
Prescribed by ANSI Std. Z39-18

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**A COMPREHENSIVE ANALYSIS OF THE ENVIRONMENTAL
REMEDIATION INDUSTRY**

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Submitted in partial fulfillment of the
requirements for the degree of

MASTER OF SCIENCE IN MANAGEMENT

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ABSTRACT

As a result of the legislation enacted over the past 20 years, the American Government and industry currently spending about \$115 billion a year to meet environmental goals. This amount is expected to increase to \$160 billion a year by the end of the year 2000. State and local Governments, which will have to bear a particularly large share of this increase, face over \$80 billion in investment costs for wastewater alone, and the Federal Government will have to spend about \$200 billion simply to clean up contaminated Department of Defense and Department of Energy installations. Altogether, the nation has invested about \$1 trillion in environmental protection over the last 20 years. This analysis was designed to find out whom the Department of Defense does business with in the Environmental Remediation Industry. Key findings of this study are (1) Environmental Remediation Companies are not dependent on the DoD business for survival, (2) Small Businesses dominate the Environmental Remediation Industry, (3) A majority of the Environmental Remediation companies provide services versus goods, (4) Environmental Remediation companies are located in states with strict environmental laws.

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TABLE OF CONTENTS

I.	ENVIRONMENTAL REMEDIATION INDUSTRY	1
A.	INTRODUCTION	1
B.	BACKGROUND	2
C.	AREA OF RESEARCH	3
D.	RESEARCH QUESTIONS	4
1.	Primary Research Question	4
2.	Subsidiary Research Questions	4
E.	SCOPE, LIMITATIONS, AND ASSUMPTIONS OF THIS THESIS	5
1.	Scope	5
2.	Limitations	6
3.	Assumptions	7
F.	METHODOLOGY	7
G.	BENEFITS OF STUDY	9
H.	ORGANIZATION OF THE THESIS	10
II.	BACKGROUND	13
A.	INTRODUCTION	13
B.	DEFINITIONS	15
C.	ENVIRONMENTAL REMEDIATION INDUSTRY BACKGROUND	17
D.	STATE REGULATIONS	22
E.	ENVIRONMENTAL FEDERALISM	25
F.	SUMMARY	28
III.	SURVEY DATA AND RESULTS	31
A.	INTRODUCTION	31

B.	PRESENTATION OF SURVEY DATA	32
C.	DEMOGRAPHIC RESULTS	33
1.	Primary Product	33
2.	Goods or Services	33
3.	Standard Industrial Classification (SIC) Codes	35
4.	Public Versus Privately Held Company	40
5.	Years In Business	41
6.	Number Of Employees	42
7.	Location	44
8.	Annual Sales Volume	45
9.	Total Value Of All Active DoD Contracts	47
D.	COMPANY CHARACTERICS	50
1.	Subcontractor Work	51
2.	Environmental Market	51
3.	Small Business Recognition	53
E.	SUMMARY	55
IV.	ENVIRONMENTAL REMEDIATION QUESTIONS	57
A.	INTRODUCTION	57
B.	PRESENTATION OF PART II SURVEY DATA	58
C.	EVIRONMENTAL REMEDIATION CHARACTERICS	59
1.	Years With DOD Controls	59
2.	Types Of Remediation Work	60
3.	Types Of Remediation Contracts	62
D.	ENVIRONMENTAL REMEDIATION COST CONTROL MEASURES	64
1.	Small Business Cost Controls	64

2. Large Business Cost Controls	65
E. ENVIRONMENTAL REMEDIATION INDUSTRY CAPABILITIES	66
1. Small Business Capabilities	66
2. Large Business Capabilities	67
F. ENVIRONMENTAL REMEDIATION INDUSTRY WEAKNESSES	68
1. Small Business Weaknesses	68
2. Large Business Weaknesses	69
G. ENVIRONMENTAL REMEDIATION INDUSTRY STRATEGIES	70
1. Small Business Strategies	70
2. Large Business Strategies	71
H. KEY PROBLEMS IN ENVIRONMENTAL REMEDIATION CONTRACTS	72
1. Small Business Problems	72
2. Large Business Problems	73
I. VOLUME OF BUSINESS TRENDS	74
1. Small Business Trends	74
2. Large Business Trends	77
J. SUMMARY	78
V. DATA ANALYSIS	79
A. INTRODUCTION	79
B. ANALYSIS OF PART I OF THE SURVEY	80
C. ANALYSIS OF PART II OF THE SURVEY	92
D. ANALYSIS OF SUMMARY QUESTIONS WHERE SIZE DID NOT MATTER	102
1. Dependence On The Government	103
2. Environmental Remediation Business Trends	105
3. Subcontracting	109

4. Environmental Remediation Business Weaknesses	110
E. ANALYSIS OF SUMMARY QUESTIONS WHERE SIZE MATTERS	111
1. Cost Controls Measures	112
2. Capabilities	114
3. Strategies	116
4. Key Problems	118
F. SUMMARY	120
VI. CONCLUSIONS AND RECOMMENDATIONS	125
A. INTRODUCTION	125
B. CONCLUSIONS	125
1. Environmental Remediation Companies are not Dependent on the DoD Business for survival	125
2. Small Businesses Dominate the Environmental Remediation Industry	126
3. A Majority of the Environmental Remediation Companies provide Services versus Goods	126
4. Environmental Remediation Companies are located in states with Strict Environmental Laws	127
5. Environmental Remediation Companies feel over- burdened by all the U.S. Government paperwork	128
C. RECOMMENDATIONS	128
1. The Military must be proactive in support of the Environmental Laws	128
2. Do not reduce or eliminate small business representative offices	129
3. Reduce the overburdening contract paperwork in dealing with the U.S. Government and DoD	130
4. The Environmental Remediation Industry needs to be educated	130

D. ANSWERS TO THE RESEARCH QUESTIONS	131
E. AREAS OF FURTHER RESEARCH	136
APPENDIX A. SURVEY QUESTIONNAIRE	139
APPENDIX B. CURRENT FEDERAL LAWS AND REGULATIONS	147
LIST OF REFERENCES	165
INITIAL DISTRIBUTION LIST	169

LIST OF TABLES

3-1	Survey Data	32
3-2	Standard Industrial Classification (SIC) Code	36
3-3	Primary Product/Service and Standard Industrial Classification (SIC) Code	39
3-4	Years in Business	42
3-5	Number of Employees	43
3-6	Percentage of Business with the U.S. Government	49
3-7	Subcontractor Work	51
3-8	Small Business Recognition	53
3-9	Small Business Category	54
4-1	Years with DOD Contracts	59
4-2	Type of remediation Completed with the DoD	61
4-3	Type of Environmental Remediation Contract	62
4-4	Small Business Common Cost Controls	65
4-5	Large Business Common Cost Controls	66
4-6	Small Business Capabilities	67
4-7	Large Business Capabilities	68
4-8	Small Business Weaknesses	69
4-9	Large Business Weaknesses	70
4-10	Small Business Strategies	71
4-11	Large Business Strategies	72
4-12	Small Business Problems	72

LIST OF TABLES (Cont)

4-13 Large Business Problems	73
4-14 Small Environmental Remediation Business Trends-Increased	76
4-15 Small Environmental Remediation Business Trends-Decreased	77
4-16 Large Environmental Remediation Business Trends-Increased	77
4-17 Large Environmental Remediation Business Trends-Decreased	78
5-1 Percentage of Business with the U.S. Government	105
5-2 Small Business Common Control Measures	112
5-3 Large Business Common Control Measures	113
5-4 Small Business Capabilities	114
5-5 Large Business Capabilities	116
5-6 Small Business Strategies	117
5-7 Large Business Strategies	118
5-8 Small Business Problems	119
5-9 Large Business Problems	120

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LIST OF FIGURES

2-1	Lester's Capacity/Motivation Model	26
3-1	Goods Versus Services	34
3-2	Survey Standard Industrial Classification (SIC) Codes	37
3-3	Public Versus Privately Held Companies	40
3-4	Location of the Environmental Remediation Industry	45
3-5	Annual Sales Volume	46
3-6	Total Active Contracts With the Department of Defense	48
3-7	Environmental Remediation Company Foreign Sales	50
3-8	Environmental Market	52
4-1	Environmental Remediation Industry Trends	75
5-1	Environmental Remediation Industry Trends	106
B-1	Environmental Laws, Regulations and Acts	147

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I. ENVIRONMENTAL REMEDIATION INDUSTRY

A. INTRODUCTION

This thesis provides a detailed analysis of the Environmental Remediation Industry. The purpose of this thesis is to determine the nature of the Environmental Remediation Industry and illustrate how a comprehensive analysis of the industry can contribute to better contractual relations between the Federal Government and Environmental Remediation companies. The objective is to determine what insights the Government can gain by studying the Environmental Remediation supplier base of the United States. Using surveys and interviews, this study evaluates the Environmental Remediation supplier base and shows how it can contribute to enhanced environmental contracts.

A survey was sent to over 424 Environmental Remediation companies across the United States that have contracts with the Department of Defense (DoD). The survey results were used to develop a picture of how Department of Defense acquisition personnel conduct business within the commercial sector. By understanding their business partners, acquisition personnel can determine how to improve the relationship between the U.S. Government and the Environmental Remediation Industry.

This industry has undergone significant reorganization over the past few years while the Government has reengineered its

business practices. Within the past five years, the implementation of the Department of Defense Base Realignment and Closure (BRAC) and the Formerly Used Defense Sites (FUDS) brought on the need for environmental cleanup. This situation has increased the need for Environmental Remediation companies and has caused the industry to grow by leaps and bounds. As this thesis will show, the majority of Environmental Remediation companies have come into existence within the past five years.

B. BACKGROUND

Because of legislation enacted over the last 20 years, American industry and government are currently spending about \$115 billion each year to meet environmental goals. This amount is expected to increase to \$160 billion each year by the end of the decade. State and local Governments, which will bear a large share of this increase, face more than \$80 billion in investment costs for wastewater management alone. The Federal Government will spend about \$200 billion simply to clean up contaminated Department of Defense and Department of Energy installations. Altogether, the nation has invested about \$1 trillion in environmental protection over the last 20 years (General Accounting Office 1992).

The contracting world is one of the most carefully watched and scrutinized processes in which the military is involved. One

of the Department of Defense's genuine environmental concerns is cleaning up its "Sins of the past 200 years." Former Secretary of Defense Cheney defined the Department of Defense mission as follows: "I want every command to be an environmental standard by which Federal agencies are judged" (Fugh, Issacaon, & Rouse 1990, p.3). To assist in accomplishing this mission and to provide guidance, "the Secretary has promulgated a new environmental ethic for the Department of Defense" (Fugh, Issacaon, & Rouse 1990). That ethic is expressed in three phrases: (a) compliance with the law, (b) responsibility as careful stewards of vast natural resources, and (c) cooperation with Federal, state, and local regulations (Fugh, Issacaon, & Rouse, 1990).

C. AREA OF RESEARCH

The purpose of this thesis is to determine the nature of the Environmental Remediation Industry and illustrate how a comprehensive analysis of the industry can contribute to better contractual relations between the Federal Government and environmental companies. Through research, which includes a survey and interviews, a comprehensive description of the Environmental Remediation supplier base will be presented.

This thesis investigates the challenges that the DoD faces in the field of Environmental Remediation. These challenges

include looking at patterns and trends that the industry has used over the past ten years. Also, a review of the strategies that the industry may use to improve future contracts between the Federal Government and Environmental Remediation Companies will be presented.

D. RESEARCH QUESTIONS

The following research questions have been developed to assist in the research:

1. Primary Research Question

What is the nature of companies involved in Environmental Remediation Industry, and how might a comprehensive analysis of the industry contribute to improved contractual relations between the Federal Government and environmental companies?

2. Subsidiary Research Questions

To answer the primary question listed above, it is necessary to address the following subsidiary research questions:

- a. What is a working definition of the Environmental Remediation Industry?
- b. What patterns or trends concerning the nature of the environmental industry have emerged during the past 10 years?

- c. What strategies do firms in this industry use to gain Government Environmental Remediation contracts?
- d. How might the knowledge acquired through research of the Environmental Remediation Industry be most effectively used in structuring contractual arrangements?

E. SCOPE, LIMITATIONS, AND ASSUMPTIONS OF THIS THESIS

The study population consists of many Remediation companies across the nation. The names of these companies were acquired through magazines, trade journals, and professional organizations. The researcher also used the Small Business Administration's (SBA) Internet-based program, PRONET. This program allowed the researcher to use the Internet to send surveys to Environmental Remediation companies.

1. Scope:

- a. Contracts for the Department of Defense—Army, Navy, Air Force, and Marine Corps;
- b. Geographically Environmental Remediation companies within the continental United States; and
- c. Time contractors that have been awarded Environmental Remediation contracts by the Department of Defense within the last five years.

The researcher examined the Environmental Remediation Industry to develop a comprehensive description of the

Environmental Remediation supplier base. The thesis examines the nature, size, Standard Industrial Classification (SIC) Codes, years in business, number of employees, location, annual sales volume, and the industry's working environment. It is not within the scope of this thesis to discuss specific application of the Federal Acquisition Regulation (FAR) or to evaluate current Government contracts for Environmental Remediation.

2. Limitations

As the researcher conducted an initial search, it became apparent that a current database of Environmental Remediation companies did not exist. An Army Corps of Engineers database was finally located; however, it was not current because many of the companies had either moved from their address or had gone out of business.

The questionnaire was sent to 424 Environmental Remediation companies within the United States. Of the 424 solicited surveys, 96 were returned within the two-month time constraint for a 22.64% response rate. An additional 29 surveys were returned because either the address was incorrect or the company was no longer in business. Thirty-eight of the companies requested to remain anonymous, and 58 identified themselves and agreed to discuss their responses.

3. Assumptions

The researcher assumes that the reader of this thesis has some familiarity with the Environmental Remediation Industry and the acquisition and contracting field. Additionally, definitions for words used throughout the survey are provided in Chapter II.

F. METHODOLOGY

The study reviewed data compiled by the General Accounting Office (GAO) and the researcher's questionnaire from the Environmental Remediation companies. The researcher asked Environmental Remediation companies of various sizes questions about critical elements of the Environmental Remediation supplier base and pricing strategies firms in this industry use in preparing bids/proposals for Environmental Remediation. The researcher also asked how might the knowledge acquired through market research associated with the Environmental Remediation Industry be most effectively used in structuring contractual arrangements.

Literature was obtained from the Dudley Knox Library, the DLSIE, the Defense Technical Information Center (DTIC), the Small Business Administration, and the World Wide Web. Literature included current publications, periodicals, articles, case studies, Federal regulations, and previous theses. A

literature review determined the actual benefits of contracting with the environmental industry.

An analysis of trade journals, Environmental Remediation articles, reports, and documents helped determine patterns or trends regarding the size and nature of the environmental industry during the past 10 years. Interviews were conducted with experienced professionals, Government personnel familiar with the Environmental Remediation Industry, and Remediation businesses. Both oral and written interviews were used to gather data from civilian contracting officers on their personal views of uniqueness and problems with the Environmental Industry.

The researcher developed the following series of items that were then applied to the raw data obtained from the responders to classify the Environmental Remediation supplier base. The items became the basis of survey questions that were distributed to over 424 Environmental Remediation companies across the United States.

- Goods vs. services
- Industry found by state and by SIC Code
- Public or privately held
- Years in existence
- Number of Employees
- Annual sales
- Total value of active contracts with the

- Percentage of business with the DoD
- Foreign sales
- Market position—monopolistic or fully competitive
- Small business vs. large business
- Number of 8(a) firms
- Type of remediation work performed
- Type of remediation contracts with the DoD
- Primary weaknesses
- Primary strategies
- Key problems
- Trends

G. BENEFITS OF STUDY

Given the millions of dollars involved and the sensitivity of Environmental Remediation, it should be obvious that an effective plan of attack is needed. The purpose of this thesis was to examine our business partners in the Environmental Remediation Industry. By learning more about whom it is we are partnering with, perhaps we can then focus the smaller Defense workforce, which has been reduced by more than 25% over the past six years, to get the most benefit from our shrinking budget. Ultimately this thesis will benefit all branches of the Department of Defense, the Defense Contract Management Command (DCMC), and possibly every other Federal Government department

and agency. In addition, by having a better understanding of our supplier base, more reasoned decisions regarding reduced oversight can be made.

H. ORGANIZATION OF THE THESIS

Chapter I, "Introduction," outlines the thesis proposal and benefits. It describes the background, purpose, research questions, research methodology, limitations and assumptions, and thesis organization.

Chapter II, "Background," presents the reader with a brief list of terms and their definitions. The second section provides a brief historical overview of the Environmental Remediation Industry.

Chapter III, "Survey Data and Results," explains how the survey was conducted and the results of the survey data. It also presents a graphical representation of the results.

Chapter IV, "Environmental Remediation Questions," continues the presentation of survey data from Chapter III. It also includes a graphical representation of the results.

Chapter V, "Data Analysis," contains an in-depth analysis of the results of the survey conducted. It breaks down the survey results into large and small Environmental Remediation companies to determine existing similarities and differences.

Chapter VI, "Conclusions and Recommendations," provides the researcher's principal conclusions and recommendations from this study. A discussion for areas of future research is also found there.

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II. BACKGROUND

As we protect our environment, we must invest in the environmental technologies of the future which create jobs. And of course there are still dangers in the world: . . . severe environmental degradation the world over: . . . as the world's greatest power, we must therefore maintain our defense and our responsibilities. . . . We worked to promote environmental sustainable economic growth.

*President Clinton, State of the Union Address, Jan 1994
(Goodman, 17 May 1994, p. 3)*

A. INTRODUCTION

Before discussing the Environmental Remediation Industry and regulations, it is essential to define a few key terms. The first section of this chapter consists of a brief list of terms and their definitions to assist the reader in better understanding the chapters which follow. The second section provides a brief historical overview of the Environmental Remediation Industry. The final section discusses the evolution of the Federal and state regulations governing our environment.

Over the next 20 to 30 years, Federal, state, and local governments and private industry will commit billions of dollars annually to clean up sites contaminated with hazardous waste and petroleum products. This commitment will result in an increase in the use of all types of site Remediation services. While existing technologies to remediate contaminated sites have been successful, the additional investment in site cleanup offers new

opportunities for the development of less expensive and more effective solutions (EPA Circular, December 1993 p. 2).

Remediation of contaminated soil and groundwater at hazardous waste sites has been in full swing for about ten years. During this relatively short period, the environmental industry has seen tremendous changes in both strategy and technique. In the beginning, it was thought that success could only be achieved if you moved and treated as much soil and water as possible, often at great expense and additional risk to the environment. Little, if any, thought was given to the simple processes of nature that could be harnessed to accomplish the job at a fraction of the cost and no added risk. Who would have thought that feeding molasses to naturally occurring microorganisms could result in the destruction of technology-defying chlorinated hydrocarbons? Yet, the application and manipulation of such processes, achieved through a highly specialized blend of science and engineering, represent the future of Remediation technology at hazardous waste sites around the world (Suthersan 1997).

Former Secretary of Defense Richard Cheney defined the Department of Defense mission and promulgated a new environmental ethic for the Defense Department with the following quote: The Department of Defense ethic is expressed in three words—Compliance with the law, responsibility as careful stewards of vast natural resources and cooperation with Federal, state and local regulations. (Sutherson 1997)

Critical to the Environmental Remediation Industry is the constant changing of federal, state and local law and regulations. (For a complete list of the most important and current federal laws and regulations relating to the Environmental Remediation Industry, see appendix B.)

B. DEFINITIONS

Before discussing the Environmental Remediation Industry, it is essential to establish a basic level of understanding of a few key terms. The following is a list of terms that are pertinent to the Environmental Remediation Industry:

Environment - the navigable waters, the waters of the contiguous zone, and the ocean waters of which the natural resources are under the exclusive management authority of the United States under the Fishery Conservation and Management Act of 1976; and any other surface water, groundwater, drinking water supply, land surface or subsurface strata, or ambient air within the United States or under the jurisdiction of the United States. The sum of all external conditions affecting the life, development, and sustenance of an organism. Includes water, air, land, and the interrelationship that exists among and between water, air, and land and all living things. The term is also used to denote various types and categories of environments,

including, but not limited to: aquatic ecosystems; aquatic environment; benthic region; ecosphere; general environment; human environment; indoor climate; work environment; ambient; ecological impacts; ecosystems; habitats; lithosphere; natural and physical environment; socio-economic environment (Gove 1981, p. 229)

Environmental Remediation - the cleanup or other method used to remove or contain a toxic spill or hazardous material from a Superfund site. Methods include evaluation, repair, enclosure, encapsulation, or removal of greater than three linear feet or square feet of asbestos containing material from the building (EPA Public Law 105-34, Subtitle E of Title IX 1999). The remedial techniques are divided into two basic types: on-site methods and removal methods. Most remedial techniques are used in combination (e.g., pump and treat systems) rather than singly (Cunningham, Cooper, Gorham, & Hepworth 1998, p. 872; Standard & Poors Industry Surveys 1998, p. 27).

Environmental Restoration - the science of returning a damaged ecosystem to a close approximation of its condition prior to disturbance. The important factor is that the ecological damage to the resource is repaired. Merely returning the species that were lost does not constitute ecological restoration. If restoration is fully successful, the system will be self-maintaining and integrated into the larger ecological

landscape in which the damaged patch exists (Eblen & Eblan, 1994, p. 609).

Remediation Engineering - The next phase after environmental remediation in the evolution of environmental engineering. The development and implementation of strategies to clean up (remediate) the environment by removing the hazardous contamination disposed in properties since the beginning of the industrial revolution (Sutherson, 1997, p. 1).

Source Reduction - any practice which:

1. reduces the amount of any hazardous substance, pollutant, or contaminant entering any waste stream or otherwise released into the environment (including fugitive emissions) prior to recycling, treatment, or disposal; and
2. reduces the hazards to public health and the environment associated with the release of such substances, pollutants, or contaminants.

Generators - any person, by site, whose act or process produces hazardous waste identified or listed on Part 261 of this chapter or whose act first causes a hazardous waste to become subject to regulation.

C. ENVIRONMENTAL REMEDIATION INDUSTRY BACKGROUND

Environmental regulation has become a major factor in American politics and public policy. This regulation is what

triggered the Environmental Remediation Industry. Both public recognition of the problem (in the wake of several environmental disasters) and political activism during the 1960s set the enforcement agenda. In the 1960s, Congress enacted the first generation of Federal regulation. More stringent regulation followed in the 1970s. After a pause, caused by politics and the need for science to catch up with policy, new and even more demanding regulations were enacted in the 1980s. The 1990s witnessed the enforcement of these regulations increasingly shifting to the states (Sutherson 1997).

Environmental legislation and regulation have developed incrementally since the 1960s. (Major American environmental laws enacted from 1960s through 1990s are summarized in Appendix B.) The 1960s saw environmental issues firmly established in Federal policy agenda, but the substance of the legislation was relatively thin. Technical knowledge was lacking, and institutional capabilities to deal with these ill-defined problems were often nonexistent. Until the late 1960s and early 1970s, many factories frequently misunderstood or ignored the environmental impact of their operations. The capacity for the earth to provide resources and to accept waste seemed infinite. The industrial revolution, however, was straining global capacity. By the 1970s, rivers were dying, the Rhine was on

fire, Lake Erie was all but dead, and the air was becoming unbreathable in many urban areas (Wilson & Saserville 1998).

The Federal Government responded to the growing popular environmental movement but, at first, took only cautious steps and their actions set the stage for the 1970s, the environmental decade. The early environmental movement won broad support and popular acceptance by Earth Day 1970. Politicians recognized and seized this situation early in the decade. President Nixon placed himself at the center of environmental issues to preempt support for his likely 1972 rival, Senator Muskie, the congressional champion of environmental legislation. With the president and a key senator from the opposite party both supporting environmental action, the Government responded with a series of environmental acts (Wilson & Saserville 1998). The major Federal environmental laws (see Appendix B), particularly those of 1972 and 1976 illustrate the power of politics. These laws have endured—many of the laws from the early 1960s and throughout the 1970s significantly impact environmental regulations today.

Congress initiated environmental laws that prescribed how companies should manage their impact on selected parts of the environment. Each decade imprinted environmental issues in its own way:

The 1970s was the decade of denial, the 1980s was the decade of data and the 1990s was the decade of dialogue with the public (Popoff 1998, p. 4).

The 1970s institutionalized environmental regulation and discovered many problems in implementing those regulations. Lack of technical knowledge about pollutants and their effects, coupled with delays in developing technical solutions to problems, required amending the regulation. Institutional shortcomings also led to a change in requirements. In any case, problems with 1970s regulation plus the anti-regulatory ideology of the Reagan Administration put new environmental regulation on hold for much of the 1980s. Only legislation addressing the extreme problems of toxic waste, along with a few amendments to the 1970s standards, succeeded in clearing congressional and administration hurdles making it into law (Kraft & Vig 1996; Ringquist 1993).

The 1980s debate centered on ideology and cost. Republicans, pushing President Reagan's New Federalism concepts, backed an ideology of deregulation-removing Federal Government oversight from a number of regulated sectors and areas. Democrats were generally successful in keeping Federal environmental regulation in place, but at the time all sides recognized its high costs, to both government and regulated businesses. This debate carried over into the 1990s, particularly into the 104th Congress and its anti-regulatory

ideology (Kraft & Vig 1996; Ringquist 1993). Because no one knew how to effectively remediate the pollutants, environmental regulations of most pollutants are now in their fourth through sixth generation (see Appendix B).

Environmental laws and regulations are designed to address the specific problems of various mediums of pollution-air, water, and waste. They are further disaggregated by the source of the pollution or its severity. This fragmentation carries over into the organization of the regulatory agencies (Rosenbaum 1991). Separate offices, agencies, and committees regulate air, water, and waste, with further subdivisions such as drinking water versus ground water versus waste water. In the executive branch, for example, there are presently more than 30 Federal agencies with environmental "turf," divided between 11 cabinet departments plus the Environmental Protection Agency (EPA) (Kraft & Vig 1996; Rosenbaum 1991). Though the EPA was designed to consolidate executive branch regulation of pollution, it was created by executive order, not law (Buck 1991; DeWitt 1994). "In political terms, this means that the EPA is not a single gorilla, but a whole family of gorillas, one for each law and each program" (DeWitt 1994)

Likewise, the committees with oversight responsibility number in the teens for each house of Congress (Alston 1990). The Federal court system addresses environmental law decisions

throughout its 55 divisions, with jurisdiction lying in over 100 separate courts (Hoban & Brooks 1987). A community of organized interests that reflects diverse memberships, strategies, and agendas matches this dispersed policy community (Hager 1990).

These laws caused the Environmental Remediation Industry to grow. Initially, Environmental Remediation began slow, but soon picked up steam. During the late 1980s, the Department of Defense reduced its force and structure. Congress approved the Base Realignment and Closure (BRAC) recommendations, which allowed for multimillion-dollar clean-up contracts. As this survey will show, most Environmental Remediation companies have been in existence for 6 to 10 years. This time period coincides with Department of Defense downsizing. Along with Federal regulations, individual states were also writing their own regulations. The next section will discuss these state regulations.

D. STATE REGULATIONS

The states each address environmental protection and regulation in their own unique fashion, with health agencies, mini-EPAs, or environmental "superagencies" charged with enforcement of Federal and state standards (Ringquist 1993). Some states delegate enforcement to local agencies for specific pollutants or mediums. In some cases, these local agencies have

had extensive experience in environmental regulation. For example, Los Angeles County, California, has been regulating air quality since 1948 (Thomas 1976). Many states also separate endangered species and historic preservation regulation from pollution regulation, creating even more agencies with environmental oversight authority.

Environmental regulation began in the states before it became a Federal issue; however, early Federal efforts set national quality standards that were enforced then at the state level. During the 1970s, the Federal Government began enforcing many of its own standards, but during the 1980s, the pendulum swung back toward the states under the administrative umbrella of "partial preemption," which requires states to enforce Federal standards (Conlan, Riggle, & Schwartz 1995).

As the twenty-first century begins, all 50 states enforce Federal air quality standards, 48 states enforce Federal waste regulations, and at least 38 states implement Federal water quality standards (Ringquist 1993). This transfer of power, now largely without the Federal funding that had traditionally accompanied such enforcement shifts, continued at an accelerated pace into the mid-1990s. Until recently, the American state government was considered the weakest link in the Federal-state-local chain. This has changed; states are often characterized as engines of policy innovation and positive change. "The notion of

states as laboratories for policy experimentation is about to receive a "thorough test" (Pagnano & Bowman 1995). States initiate autonomous policy and action. The combination of increased state capability, Federal devolution of policy implementation, and cutbacks in Federal funding for the increased state policy roles has created a complex mix of state actions and policies. State policy decisions are centered on economic issues and concerns, and states are in direct economic competition with one another (Brace & Jewett 1995). Yet, while economic factors are a large part of the reason for state and local environmental enforcement, they are not the only reason.

A recent survey of the literature on what influences state decisions on redistributive policy issues, including health and safety issues (which are closely related to environmental issues), found that the three key determinants of state policy decisions are: (a) unified party control of both the executive and legislature, (b) a sizeable and strong bureaucracy, and (c) significant recent changes in the state population. The next tier of influence comes from: (a) economic competition from neighboring states; (b) state fiscal condition at the time of the decision; (c) ideology of the state representatives (as determined by party affiliation); and (d) demand, particularly as expressed by organized interest groups. The third tier in

importance is interparty competition and per capita income (Brace, 1996).

E. ENVIRONMENTAL FEDERALISM

Do these same factors apply specifically to environmental policy and regulation? A growing body of literature examines environmental Federalism, much of it consisting of in-depth studies of one environmental type or policy area. The "bottom line" derived from these studies is that each environmental type has its own unique policy parameters, but each includes significant input from Federal oversight, state political factors, complex state economic factors, and state organizational capacity (Hedge, Scicchitano, & Metz 1991).

Based on separate studies and rankings of the states on the capacity and commitment dimensions of the environment, James P. Lester classifies the states into four categories. As shown in Figure 1, the categories are progressives, strugglers, delayers, and regressives. His first group, the "progressives," combine a high degree of environmental commitment with strong institutional capacity—they have the motivation and capacity to enforce stringent environmental standards. These states will fully enforce Federal standards, and they will likely add additional state standards in many areas. The second group, the "strugglers," combine a high degree of commitment with limited

institutional capacities—they want to be forceful in their regulation but have only limited resources to pursue their environmental goals. These states should fully enforce Federal standards, but will be slower and less innovative than the "progressives" in adding their own environmental programs (James 1994).

Figure 2-1: Lester's Capacity/Motivation Model

<u>Progressives:</u> High capacity and motivation	<u>Strugglers:</u> Limited capacity, high motivation
California New Jersey	Colorado Montana
Florida New York	Connecticut Nevada
Maryland Oregon	Delaware New Hampshire
Massachusetts Washington	Hawaii North Carolina
Michigan Wisconsin	Idaho North Dakota
	Iowa Rhode Island
	Maine Vermont
	Minnesota
<u>Delayers:</u> High capacity, limited motivation	<u>Regressives:</u> Neither capacity nor motivation
Alabama Oklahoma	Arizona Nebraska
Alaska Pennsylvania	Indiana New Mexico
Arkansas South Carolina	Kansas South Dakota
Georgia Tennessee	Kentucky Utah
Illinois Texas	Mississippi Wyoming
Louisiana Virginia	
Missouri West Virginia	
Ohio	
Source: Lester, "A New Federalism? Environmental Policy in the States" 1994, P.51-68	

Group three, the "delayers," have the institutional capacity to support a strong environmental program, but lack the commitment to go beyond Federal standards. Many of these states have a strong energy industry presence in the state economy.

They are predicted to implement Federal standards slowly and to not advance beyond the Federal requirements. Finally, group four, the "regressives," lack both the capacity and commitment to environmental ends. They may not even fully implement Federal standards, according to Lester, and will not take any further environmental actions (James 1994).

The utility of Lester's grouping is readily apparent—though Wyoming was ranked first or second in spending, Lester places the state in the "regressive" category of expected state action. Spending alone may not be an accurate measure of environmental regulations. This capacity/motivation model provides significant information for designing a state compliance strategy for civilian corporations and military installations.

Former Secretary of Defense Cheney defined the Department of Defenses' Environmental mission as follows: "I want every command to be an environmental standard by which Federal agencies are judged" (Fugh & Scott 1990, p.8). To assist in accomplishing this mission and to provide guidance, he issued a new environmental ethic for the Defense Department. In the future, individual states will continue to create environmental regulations. The political pressures favoring decentralized enforcement are too broadly based to reverse course any time soon. Further, national polls indicate that public opinion

solidly supports continuing environmental regulation (Lester & Lombard 1990)

Managers at all levels must monitor and analyze these political and economic factors to anticipate and respond to changing state regulation demands. The compliance strategy adopted by these managers must be aimed toward meeting legitimate Federal, state, and local standards, regardless of who is enforcing those standards and within the demands of accomplishing the national security mission. To develop such a strategy, one must understand the context and the letter of multi-layered regulation. All such strategy must ultimately be focused on the specific demands of state and local requirements.

F. SUMMARY

The Environmental Remediation Industry has undergone many changes over the past 10 years. States have taken a more active role in not only enforcing Federal environmental regulations, but in also authoring their own regulations involving the environment. This chapter addressed the background of the Environmental Remediation Industry and the laws and regulations that must be addressed by all companies within this industry. Of all the Federal, state, and local regulations that each state has enacted, civilian corporations and the military must follow,

for the most part, the most stringent regulations. The next chapter looks at the methodology and data presentation of a survey sent out to more than 400 Environmental Remediation Companies.

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III. SURVEY DATA AND RESULTS

A. INTRODUCTION

Over the next 20 to 30 years, Federal, state, and local governments, along with private industry, will commit billions of dollars annually to clean up sites contaminated with hazardous waste and petroleum products (Profile of Innovative Technologies, 1993).

This chapter presents and analyzes the data that were collected concerning the survey population's demographics. All material presented in Chapter III used the results of Part I of the survey as its source. The objective of Part I of the survey was to conduct a demographic study of the companies that are currently doing business in the Environmental Remediation Industry. The goal of this section is to give a broad picture of the average Environmental Remediation company doing business with the Department of Defense. This chapter explains how the survey was conducted and provides the results of the survey data. Chapter IV will provide an in-depth analysis specifically on Environmental Remediation companies using Part II of the survey as its source. Chapter V will provide an in-depth analysis of the results of the survey, analyzing Parts I and II of the survey. It will also break down the survey results into

large and small Environmental Remediation companies. Chapter VI will discuss conclusions and recommendations for the Environmental Remediation Industry.

B. PRESENTATION OF SURVEY DATA

The following is a representation of the results of Part I of the survey. The survey was sent to a total of 424 Environmental Remediation Companies. The researcher requested that they conduct the survey and return it within two months of receipt. Table 3-1 illustrates the breakdown of survey data. Of the 424 solicited surveys sent out, 96 were returned within the two-month time constraint for a 22.64% response rate. An additional 29 surveys were returned because either the address was incorrect or the company was no longer in business. Thirty-eight

TABLE 3-1 SURVEY DATA	
Surveys Sent	424
Replies received	96
Returned Wrong Address	29
Total Received	96 (22.64%)
Source: Developed by Researcher	

of the companies requested to remain anonymous and fifty-eight identified themselves and agreed to discuss their responses.

C. DEMOGRAPHIC RESULTS

Questions 1-6 of the survey served the purpose of acquiring demographic information regarding the responding Environmental Remediation firms. These questions centered on the firm's type, number of employees, type of sale, primary location of customers, and annual sales volume.

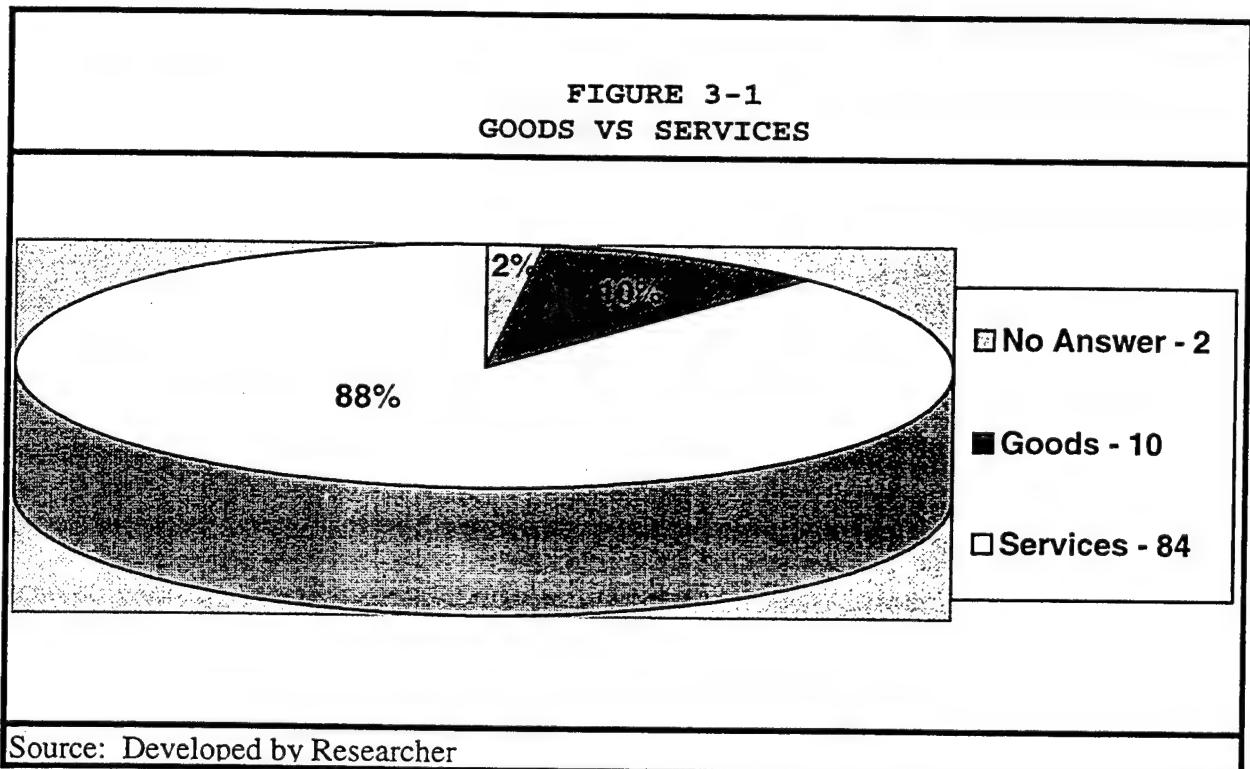
1. Primary Product

The survey's first question was asked in such a way as to receive a texted answer from the surveyed companies. The primary reason for this question was to get a feel for how the companies classified themselves beyond the confines of the Standard Industrial Classification (SIC) codes. Of the 96 respondents, only two respondents did not answer this question, and both were identified as small companies. The overwhelming majority of respondents answered "Environmental Remediation." The other classifications that were listed as the primary product or service of the surveyed companies were: Construction, Civil/Environmental Consulting, Engineering Services, Environmental and Geotechnical Engineering Services, Environmental Consulting, and Engineering Services.

2. Goods or Services

The purpose of Question 1B was to get a clearer picture of the Environmental Remediation Industry and determine if most of the companies consider the product they provide to the

environmental industry as a good or as a service. Eighty-four (88%) of the respondents stated that they have a contract for services (see Figure 3-1).



In the field of Environmental Remediation it is apparent that most of the companies are service oriented. Environmental Remediation companies normally remove hazardous waste and petroleum products from ground water, soils (including sediments, sludge, and debris) and air. Ten (10%) of the companies stated that they provided goods, while two (2%) of the companies did not answer this question and appear not to have understood what this question was asking.

3. Standard Industrial Classification (SIC) Codes

Question 1C of the survey asked companies to identify their Standard Industrial Classification (SIC) Code. Standard Industrial Classification Codes are four-digit codes (all numeric) that were prepared by a multiagency Technical Committee on Industrial Classification, under the sponsorship and supervision of the Office of Management and Budget, Executive Office of the President. These codes are used for multiple reasons. A primary application is to select those companies that are in a particular line of business toward which it is desired to direct a sales campaign. On the other side of the coin, use of the SIC codes makes it possible to line up quickly and easily sources of supply for a particular product. Companies are divided into like categories for more detailed classification (Standard & Poor's 1998).

The first two digits of the Standard Industrial Classification (SIC) code show the major industrial group into which the company is classified. As can be seen in Table 3-2, there are 11 major divisions, each of which has a code range. The last two digits of the SIC code classify the company more closely in its major group. For example, a SIC code of 8744 shows

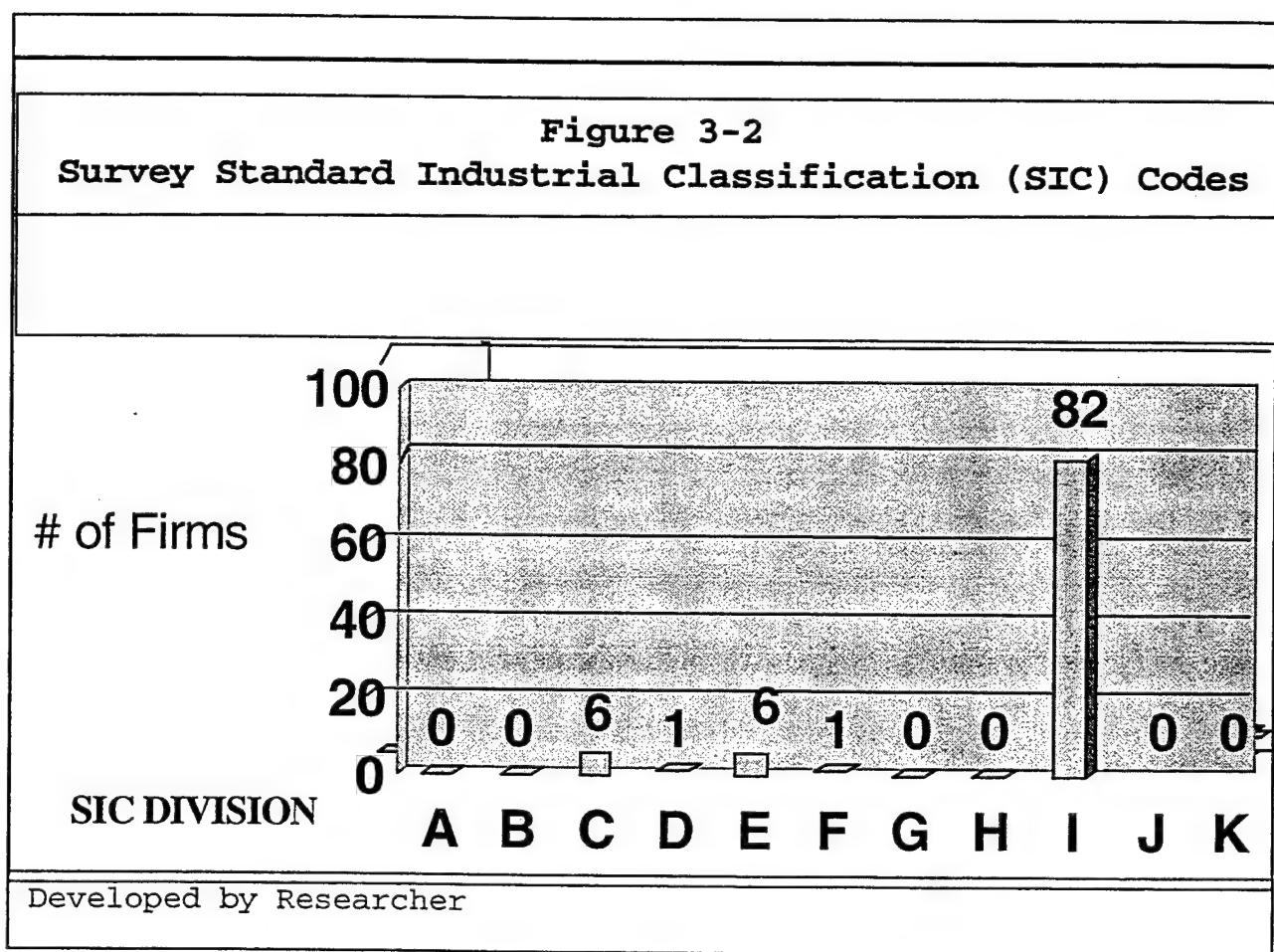
TABLE 3-2
STANDARD INDUSTRIAL CLASSIFICATION (SIC) CODES

DIVISION	SIC NUMBER	TITLE
A	01 to 09	Agriculture, Forestry, and Fishing
B	10 to 14	Mining
C	15 to 17	Construction
D	20 to 39	Manufacturing
E	40 to 49	Transportation, Communications, Electric, Gas, and Sanitary Services
F	50 to 51	Wholesale Trade
G	52 to 59	Retail Trade
H	60 to 67	Finance, Insurance, and Real Estate
I	70 to 89	Services
J	91 to 97	Public Administration
K	99	Nonclassifiable Establishments
Source: Developed by Researcher		

first that the company is a Service company, since the first two digits fall between 70 and 89. Second, as indicated in the Division of major groups, the first two digits, 87, place the company in the Engineering, Accounting, Research, Management, and Related Industry. Third, the 4 as the third digit,

signifies that the company is in Management. The 4 as the fourth digit denotes that the company is Facilities Support. So by putting the four digits together, 8744 is the Standard Industrial Classification code for Facilities Support Management Services within the major group of Engineering, Accounting, Research, Management and Related Services.

Of the 96 firms responding, all provided their SIC codes



and 11 firms provided two or more Standard Industrial Classification (SIC) codes. Because the researcher requested only the primary Standard Industrial Classification code, only

the primary SIC code is listed in the results. Figure 3-2 illustrates the breakdown of responding companies by SIC Code. Environmental Remediation Companies are inherently classified in the Standard Industrial Classification (SIC) code Major Industry of Engineering, Accounting, Research, Management and Related Services. The predominant Division for Environmental Remediation Companies is division I on the Figure, which is Services.

Of the 14 Standard Industrial Classification (SIC) Codes listed by the responders, the largest grouping was SIC code 8744 (see figure 3-3 below), "Engineering, Accounting, Research, Management and Related Services, Facilities Support Management Services," of Division I (on Figure 3-2 above), with 32% of the responses. To be listed in the Environmental Remediation Services, a concern must be engaged primarily in furnishing a range of services for the remediation of a contaminated environment to an acceptable condition including, but not limited to, preliminary assessment, site inspections, testing, remedial investigation, feasibility studies, remedial design, containment, remedial action, removal of contaminated materials, storage of contaminated materials, and security and site closeouts. One or more of these activities must account for 50% or more of the firm's total revenues, employees, or other

TABLE 3-3
**PRIMARY PRODUCT/SERVICE AND STANDARD INDUSTRIAL CLASSIFICATION
(SIC) CODE**

MAJOR INDUSTRY	SIC CODE	CLASSIFICATION DESCRIPTION	# OF FIRMS	%
Heavy Construction	1629	Not Elsewhere Classified	3	3%
Construction	1795	Wrecking and Demolition Work	3	3%
Misc. Manufacturing Industries	3999	Manufacture, Industries, Not Elsewhere Classified	1	1%
Electric, Gas, Sanitary Service	4953	Refuse Systems	3	3%
Electric, Gas, Sanitary Service	4959	Sanitary Services, Not Elsewhere Classified	3	3%
Wholesale Trade	5049	Professional Equip. and Supplies	1	1%
Eng, Accounting, Research, Mgmt and Related Services	8711	Engineering Services	23	22%
Eng, Accounting, Research, Mgmt and Related Services	8713	Surveying Services	1	1%
Eng, Accounting, Research, Mgmt and Related Services	8734	Testing Laboratories	4	4%
Eng, Accounting, Research, Mgmt and Related Services	8742	Management Consulting Services	7	7%
Eng, Accounting, Research, Mgmt and Related Services	8744	Facilities Support Management Services	32	32%
Eng, Accounting, Research, Mgmt and Related Services	8748	Business Consulting Services	10	10%
Miscellaneous Services	8999	Services, Not Elsewhere Classified	5	5%
TOTAL			96	100%
Source: Developed by Researcher				

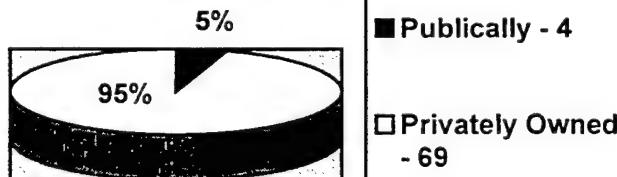
related factors to maintain SIC Code 8744 (Federal Acquisition Regulation 1999).

The second largest grouping was SIC code 8711, "Engineering, Accounting, Research, Management and Related Services, Engineering Services," also of Division I with 22% of the responses. Within Division I, there are nine major groups numbered as 8100 through 8900. Seven major groups of the possible nine (78%) are found in the Environmental Remediation Industry. The most popular major group being the 8700 series, which is Engineering, Accounting, Research, Management and Related Services.

4. Public Versus Privately Held Company

A survey question was presented to determine if the majority of Environmental Remediation Companies are held by public or privately owned organizations. This was probably the most misunderstood question on the survey. Of the 96 answers,

**FIGURE 3-3
PUBLIC VERSUS PRIVATELY HELD COMPANIES**



Source: Developed by Researcher

twenty-three (24%) did not answer this question.

Because so many firms did not understand this question, the survey discounted the 23 firms that did not answer this question. Based on the new numbers, 69 out of the 73 total, 95% of the companies answered that they were privately held (see Figure 3-3). Four (5%) responded that they were a publicly held company. The results of this question (even though many companies had misunderstood this question) clearly show that the majority of the Environmental Remediation Companies surveyed are privately owned.

5. Years in Business

The purpose of this question was to determine how many years the Environmental Remediation companies had been in business. This is important in determining if the company started up because of new Environmental Legislation in the early 1980s, because of the Military Base Realignment and Closure (BRAC) in the early 1990s, or for other reasons. Table 3-4 illustrates the breakdown of how long these Environmental Remediation companies have been in existence. Another reason for this question was to find out the maturity of each of the companies in the Environmental Remediation Industry. As can be seen in Table 3-4, most of the companies surveyed have

been in business from 6 to 10 years, with over half in business less than 10 years.

TABLE 3-4		
YEARS IN BUSINESS		
NUMBER OF YEARS	COMPANIES	%
0-5	21	22%
6-10	29	30%
11-20	18	19%
21+	17	18%
No Answer	11	11%
TOTAL	96	100%

Source: Developed by Researcher

6. Number of Employees

The purpose of Question 3 was to determine the number of employees in each Environmental Remediation company. This question becomes important when determining the size of each company and to verify the researcher's conclusion about the size of the Environmental Remediation companies (see Table 3-5). The researcher was trying to determine if the environmental remediation industry was primarily made up of relatively large companies or relatively small companies based on the number of employees. Table 3-5 illustrates a breakdown of the number of employees in each company. For the purpose of this thesis, I

TABLE 3-5 NUMBER OF EMPLOYEES		
# OF EMPLOYEES	# OF COMPANIES	%
1-19	42	44%
20-49	8	8%
50-99	16	16%
100-249	11	12%
250-499	7	7%
500-999	3	3%
1,000- 4,999	5	6%
5,000- 9,999	0	0%
10,000+	1	1%
No Answer	3	3%

Source: Developed by Researcher

have used the Federal Acquisition Regulation (FAR) Part 19, as a guide to distinguish between large and small companies, using a figure of 500 employees as the discriminator between large and small companies. More than 87% of the companies surveyed stated that they had less than 500 employees, distinguishing them as a small business, with 13% stating that they had more than 500 employees, distinguishing them as a large business. The largest single grouping of the number of employees in all the companies surveyed was in the grouping of 1-19 employees, with 44%. This is also verified by the Environmental Protection Agency (EPA) study of the Innovative Technologies and Vendors for Waste Site Remediation, which states that the majority of Environmental Remediation companies are small businesses (Profile of Innovative Technologies 1993).

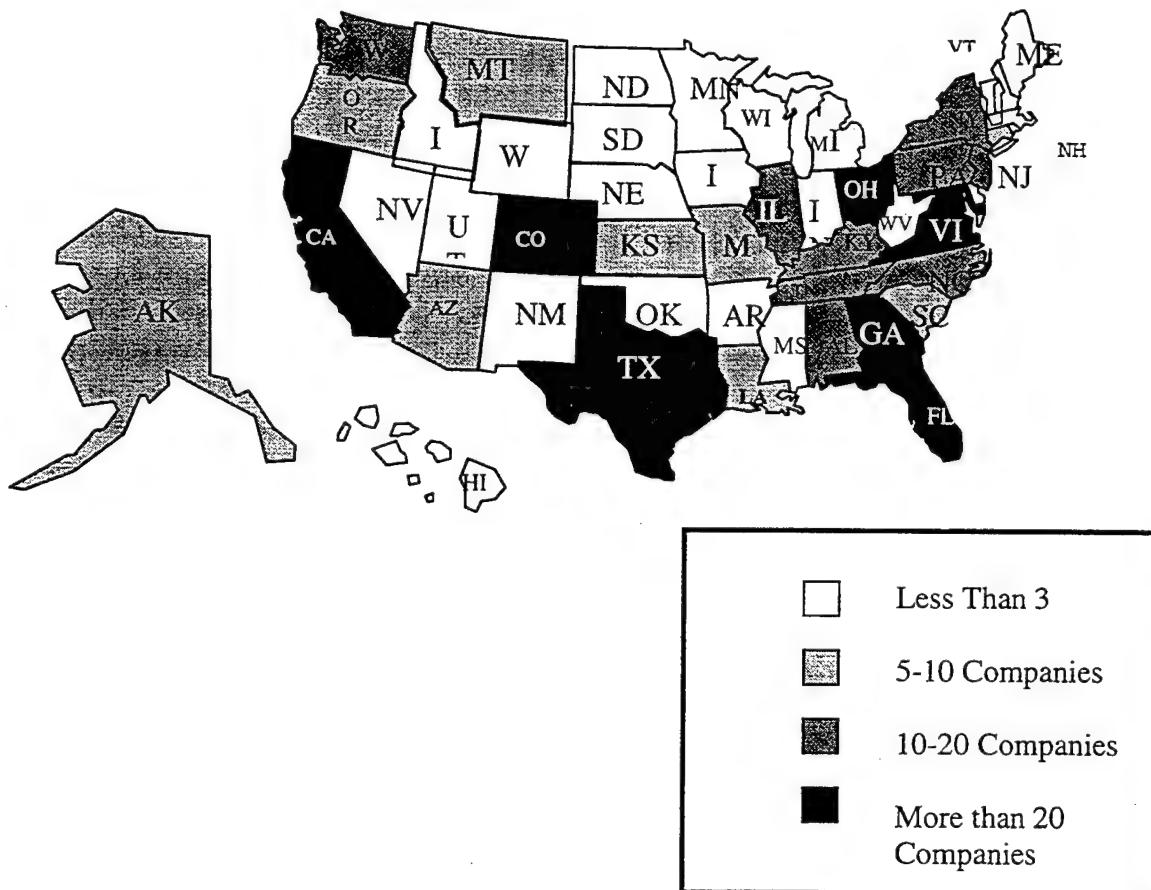
7. Location

The purpose of Question 4 was to determine the primary locations of the Environmental Remediation companies and to help get a better feel for the industry. The responses to this question become important to answer one of the thesis subsidiary questions regarding the critical elements of the environmental remediation supplier base: Are companies located in large cities or are they located near the environmental remediation sites? Environmental Remediation sites might actually be found more often in the large industrial bases of the larger states in America.

Figure 3-4 shows a graphical representation of the location, by state, of the Environmental Remediation Companies. There were six states with more than 20 Environmental Remediation Companies. Both Figure 3-4 and Lester's Capacity/Motivation Model (Figure 2-1), it becomes clear that the majority of the companies in this industry tend to be based in states with the strictest environmental laws.

Strict Environmental laws apparently tends to attract Environmental Remediation companies as can be seen in Figure 3-4.

Figure 3-4
LOCATION OF THE ENVIRONMENTAL REMEDIATION INDUSTRY



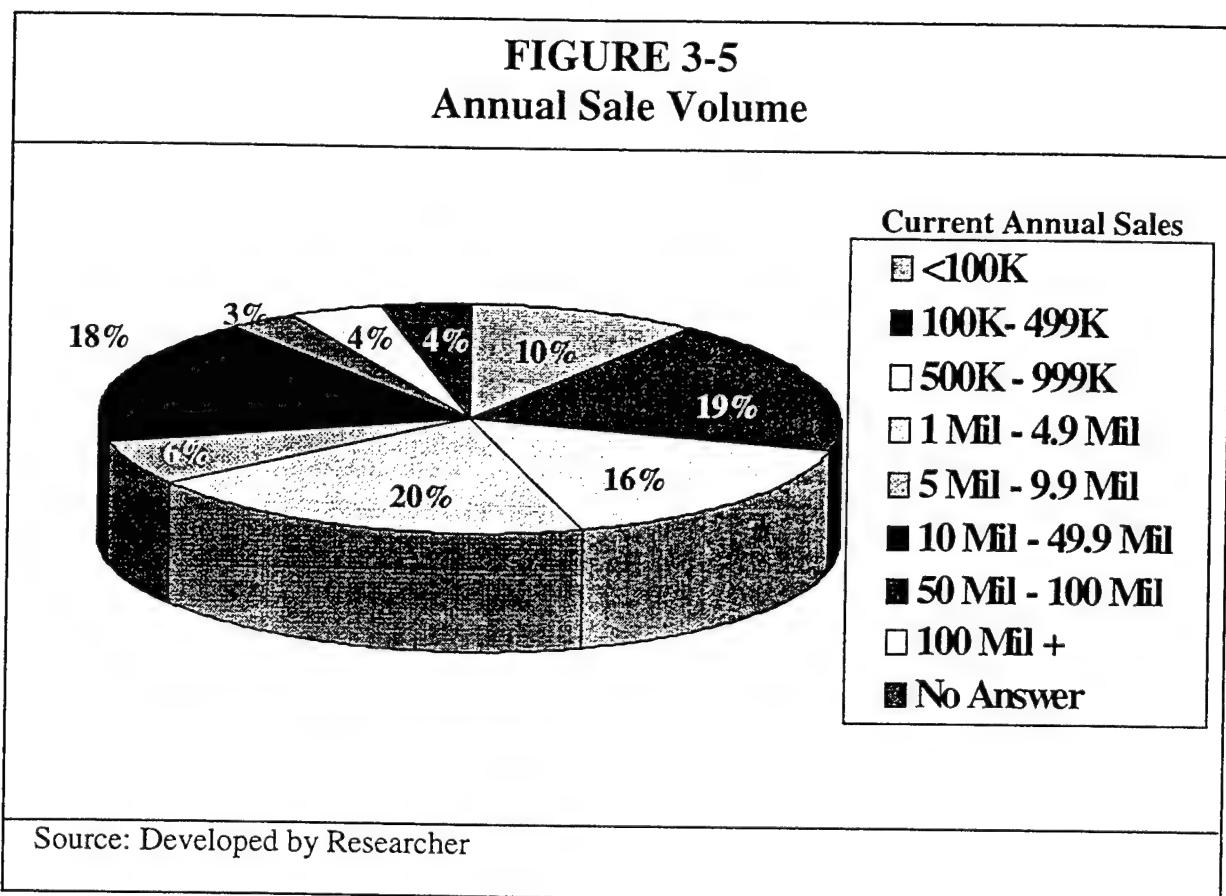
Source: Developed by Researcher

8. Annual Sales Volume

The purpose of Question 5 was to determine the annual sales volume of each company. This information was used to determine if the industry was made up of small, medium, or large companies. Figure 3-5 shows a graphical representation of the size of the 96 respondents as measured by their annual sales volume.

The largest category, with 19 responses (20%), was the "\$1

Million through \$5 Million" category, which also fits the Federal Acquisition Regulation (FAR) definition of a small



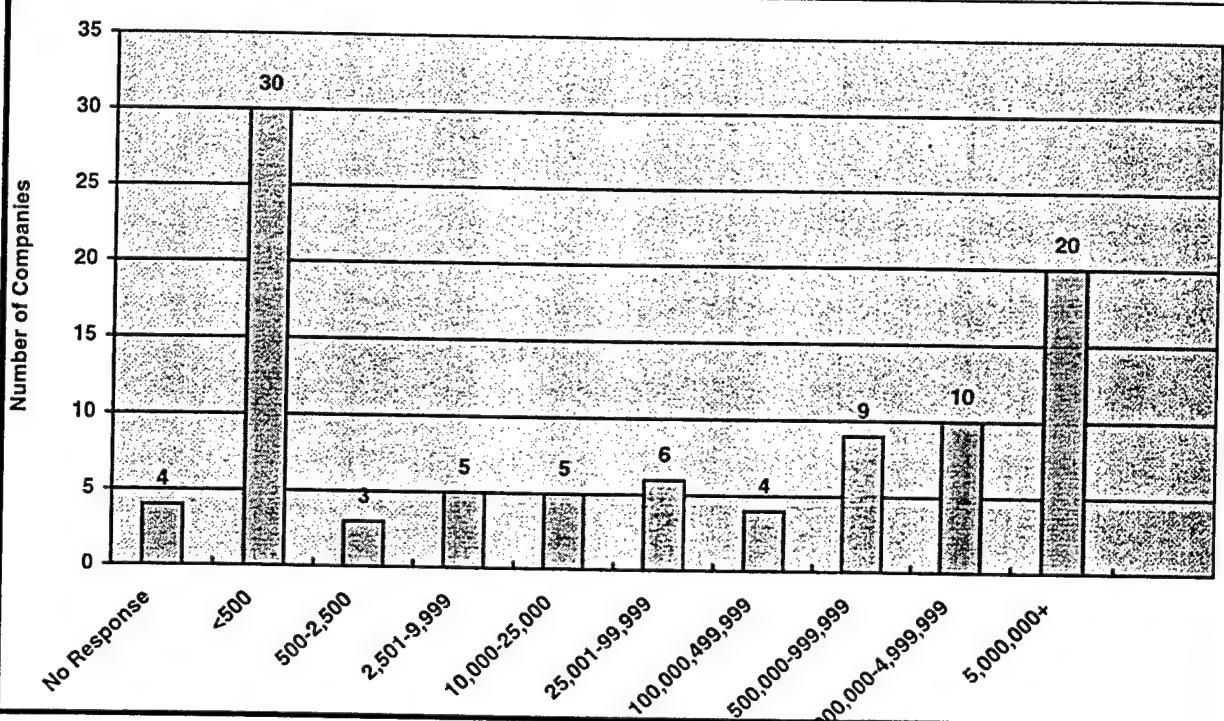
company for Environmental Remediation Companies. As stated earlier, over the next 20 to 30 years, Federal, state, and local governments and private industry will commit billions of dollars annually to clean up sites contaminated with hazardous waste and petroleum products (Profile of Innovative Technologies 1993). The largest range for all the responses (54%) was a range from between \$100,000 and \$4,999,999 in total annual sales, which classifies as a small business.

The Federal Acquisition Regulation (FAR) Part 19, Small Business Programs defines different size companies and classifies them into small businesses on an industry-by-industry basis using the annual income of the company and dividing them by Standard Industrial Classification (SIC) Codes. For the Environmental Remediation Industry SIC Code 8700, the size standard is \$5 million, except military and aerospace equipment and contracts/subcontracts for Engineering Services Awarded under the National Energy Policy Act of 1992, which is \$20 million (Federal Acquisition Regulations 1999). Of the companies surveyed, 65% were classified as small businesses, 31% were classified as large businesses, and 4% did not answer the question.

9. Total Value of All Active DoD Contracts

The purpose of Question 6 was to determine the total dollar value of all active contracts each company has with the Department of Defense. Figure 3-6 illustrates a breakdown of the value of the total amount of contracts that Environmental Remediation Companies have with the Department of Defense. The data collected show that the majority of companies that have contracts with the Department of Defense in Environmental Remediation, either have only very few contracts or have very large contracts.

Figure 3-6
Total Active Contracts with DoD



Source: Developed by Researcher

Figure 3-6 above also shows that 30 businesses (32%) either had no contracts or had contracts of less than \$500. Second were 20 businesses (21%) that did business with the Department of Defense and have over \$5 million worth of contracts.

The purpose of Question 7 was to determine the percentage of business each company has with the U.S. Government, the results of which are shown in Table 3-6. Thirty-four percent of the responding companies did either less than 5% or none of their business was with the United States Government, while 33%

TABLE 3-6
PERCENTAGE OF BUSINESS WITH THE U.S. GOVERNMENT

AMOUNT	NUMBER	PERCENTAGE
<5%	32	34%
5%-25%	17	18%
26%-50%	11	11%
51%-75%	20	21%
Nearly all Business with the U.S. Govn.	11	11%
No Answer	5	5%
TOTAL	96	100%

Source: Developed by Researcher

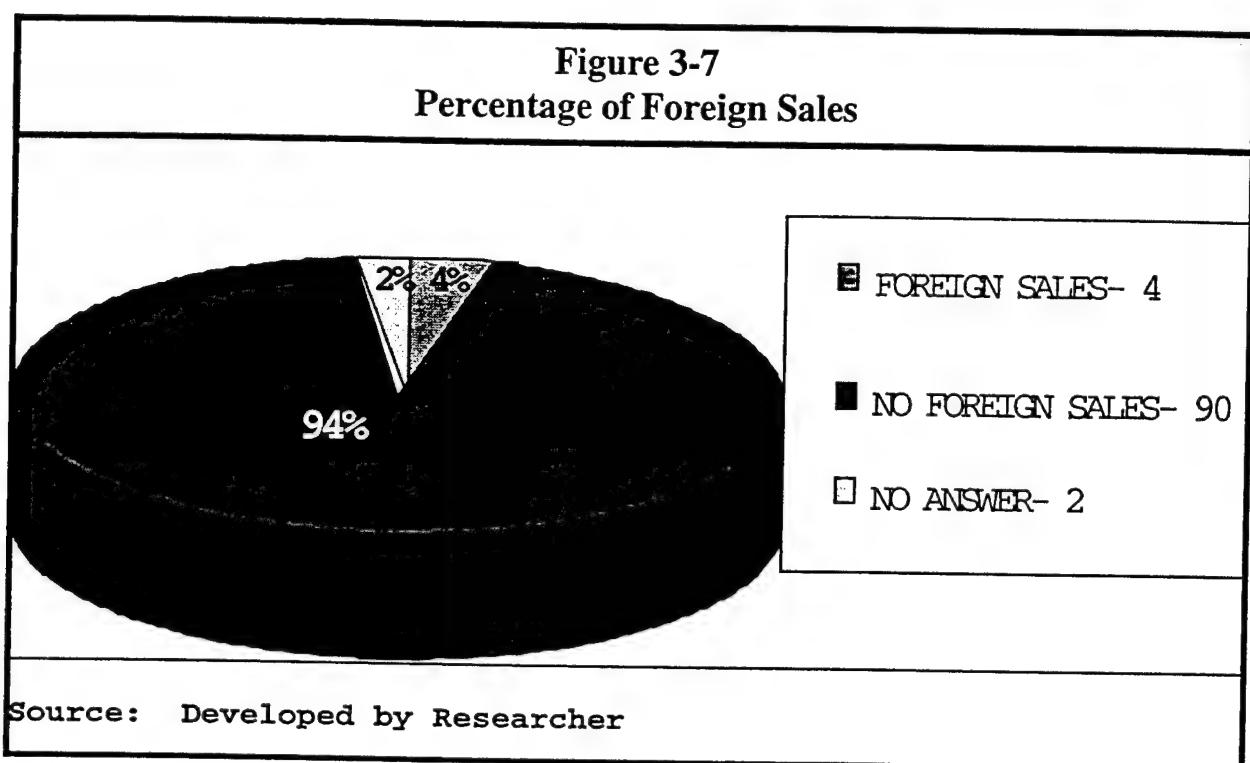
did more than 50% of their business with the United States Government. This indicates that either the majority of the surveyed companies did not do much business with the U.S. Government or the surveyed companies did not completely understand this question. It also shows that, of the surveyed companies, 60 (63%) do less than 50% of their business with the U.S. Government, while 31 (32%) of the surveyed companies did the majority of their business with the U.S. Government.

The purpose of Question 8 was to determine if any of the Environmental Remediation Companies responding dealt with foreign businesses. The thought process was to determine if any of the Environmental Remediation Companies enhanced their sales from foreign businesses.

It was also asked to determine if, after the military base closure ended, Environmental Remediation Companies relied more

heavily on foreign sources for contracts in the industry.

Figure 3-7 is a graphical representation of the percentage of



companies which dealt with foreign sources.

D. COMPANY CHARACTERISTICS

Questions 9-11 are grouped together because they give a broader picture of company characteristics. These questions centered on whether firms perform as a prime contractor or a subcontractor. It also asks if they are competing in a monopoly, an oligopoly, or in a full-competition industry. This section also classifies companies as a small business and, if so, which type.

1. Subcontractor Work

The purpose of Question 9, which asked the companies if they perform any substantial amount of work as a subcontractor for another company performing Government environmental remediation contracts, was to determine the extent of subcontracting. Table 3-7 illustrates the breakdown of the percentage of businesses that also dealt as subcontractors.

TABLE 3-7 SUBCONTRACTOR WORK		
TYPE	NUMBER	PERCENTAGE
Performs Subcontractor Work	45	47%
Performs No Subcontractor Work	39	41%
No Answer	12	12%
TOTAL	96	100%

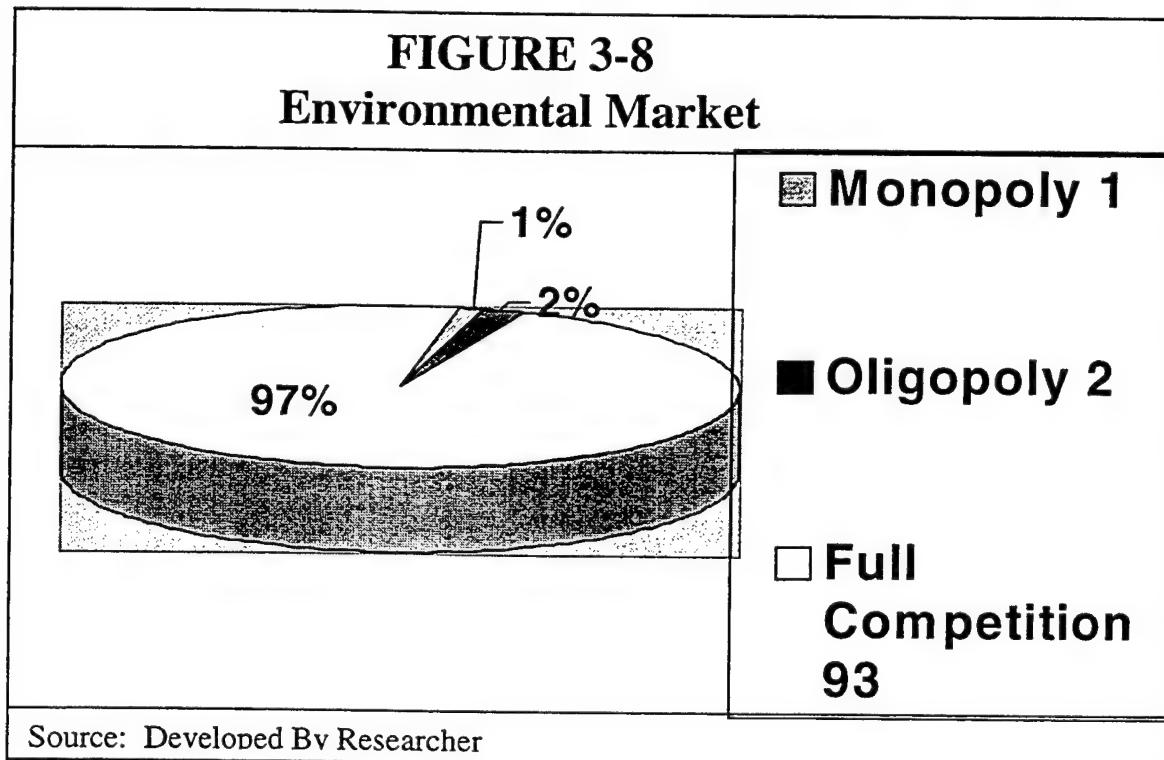
Source: Developed by Researcher

The answer to the survey showed that 45 (47%) of the Environmental Remediation companies did perform subcontractor work, while 39 (41%) did not perform subcontractor work. There were 12 Environmental Remediation companies that did not answer this question.

2. Environmental Market

The purpose of Question 10 was to determine the economic environment of the remediation companies. The three choices were as a monopoly, an oligopoly, or full competition. If the companies dealt as a monopoly, then they are considered as the

only regional or national source for their product or service. If they classified themselves as dealing in an oligopoly, then there are only one or two other manufacturers in their industry. If they classified themselves as full competition, then there were many companies competing with them for DoD Contracts. Figure 3-8 is a graphical representation of how the companies



classified themselves by percentages and by number. It appears that the Environment industry uses full competition more than 90% of the time.

3. Small Business Recognition

The purpose of Question 11a was to determine if the U.S. Government recognizes the companies as small businesses. Table 3-8 illustrates the breakdown of the percentage and also the number of businesses that are classified small businesses. The importance of this question was to assist in answering the primary research question and also to get a clearer picture of the makeup of the industry. As can be seen by Table 3-8, 79% of

TABLE 3-8 SMALL BUSINESS RECOGNITION		
TYPE BUSINESS	NUMBER	PERCENTAGE
Small Business	76	79%
Large Business	18	19%
No Answer	2	2%
TOTAL	96	100%

Source: Developed by Researcher

the companies surveyed were designated as small businesses by the U.S. Government.

The purpose of Question 11b was to get a breakdown and therefore receive a clearer picture of how the 76 (79%) companies that answered Question 11a as a Small Business classified themselves with the Small Business Administration. Table 3-9 gives a more detailed picture of this representation. The largest grouping of small businesses in Table 3-9 are Small Disadvantaged Businesses, with 33%. A Small Disadvantaged Businesses (SDB) is a small business concern that is at least

51% unconditionally owned by one or more individuals who are both socially and economically disadvantaged, or a publicly owned business that has at least 51% of its stock unconditionally owned by one or more socially and economically disadvantaged individuals and has its management and daily business controlled by one or more such individuals (Federal Acquisition Regulation 1999).

TABLE 3-9

SMALL BUSINESS CATEGORY

CATEGORY	NUMBER	PERCENTAGE
8A Firm	23	30%
Women Owned	15	20%
Veteran	3	4%
Small Disadvantaged Business	25	33%
Other	10	13%
TOTAL	76	100%

Source: Developed by Researcher

The second largest grouping was 8(a) Firms with 30% of the surveyed companies. This program takes its name from Section 8(a) of the Small Business Act. Section 8(a) authorizes the SBA to enter into contracts with other Federal agencies and to perform such contracts by subcontracting to small businesses. The 8(a) program has been subject to constant criticism. Nondisadvantaged small businesses complained that many 8(a) contracts had formerly been reserved for small businesses in

general and that the 8(a) program discriminated in favor of minority-owned small businesses (Cibinic & Nash 1998).

E. SUMMARY

This chapter presented the findings and analysis from Part I of the researcher's survey. Part I had 11 numbered questions, some of which had subquestions, for a total of 16 questions. Chapter III followed these 16 questions in the order presented in the survey. The information presented in Chapter III begins to paint a picture of the contractors in the Environmental Remediation Industry. The majority of these contractors are small businesses and independent of Government ties.

The next chapter continues where this chapter stopped. The data from Part II of the survey will be presented and analyzed.

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IV. ENVIRONMENTAL REMEDIATION QUESTIONS

A. INTRODUCTION

This chapter presents and analyzes the data that was collected concerning the survey population's Environmental Remediation contracts with the Government. All material presented here used Part II of the survey as its source.

The objective of the second part of the survey was to conduct a study of the contractual relationship of environmental remediation contractors currently doing business with the DoD. Section B of this chapter will present the answers to the second part of the questionnaire. The goal of this section is to give a broad picture of the average Environmental Remediation Company, and how it does business with the DoD. Section C of this chapter describes the Environmental Remediation Company characteristics. This will further clarify the environmental remediation industry. Section D will discuss the replies to the section of the survey, which asked about cost control measures. This section divides the replies into two sections. The first section will be of small business cost controls measures, and the second section will be of large business cost control measures. Section E will discuss the capabilities of both small and large businesses. Section F will discuss the environmental remediation industry

weaknesses of both small and large businesses. Section G will discuss strategies used by both small and large businesses to succeed in the environmental remediation industry. Section H will discuss the survey replies to the key problems in the environmental remediation contracts, both in small and large businesses. Section I will discuss the volume of businesses trends in the environmental remediation industry. The researcher wanted to fine out if the surveyed results from the industry were different from the background investigation conducted. Section J will summarize this chapter and will give a short preview of chapter 5.

B. PRESENTATION OF PART TWO SURVEY DATA

The following data are the results of the second part of the survey. Ten numbered questions covering eleven topics were asked about each company's current contracts with the Government. The Environmental Remediation Industry Survey Questionnaire and cover letter are presented in Appendix A. The answers to the second part of the survey questionnaire are presented here in chapter IV. Again, the goal of this section is to give a broad picture of the average Environmental Remediation Company, and how it does business with the Department of Defense.

C. ENVIRONMENTAL REMEDIATION CHARACTERISTICS

Questions 12 - 14 are grouped together because they give an overview and a better description of the environmental remediation industry. These questions are focused toward the specifics of the environmental industry.

1. Years with DoD Contracts

The purpose of question 12 was to determine how many years the environmental remediation companies had been involved in DoD contracts. Table 4-1 illustrates the results of question 12, which asked each company for the number of years the companies had DoD contracts for environmental clean up and remediation by number and by percentage. The researcher was surprised to see that 19% of the companies failed to answer this question. By

TABLE 4-1
YEARS WITH DOD CONTRACTS

NUMBER OF YEARS	NUMBER OF COMPANIES	PERCENTAGE
0-1 Years	33	34%
2-5 Years	22	23%
6-10 Years	8	9%
10+ Years	15	15%
No Answer	18	19%
TOTAL	96	100%

Source: Developed by Researcher

discounting the 19% of the companies which did not provide an answer to this question, it becomes clear that most

Environmental Remediation Companies (46%) have been in business 0-1 years. Over 70% of the surveyed companies have been in business for less than 5 years, and 80% of all the surveyed Environmental Remediation companies have been in business for less than 10 years. This tends to strengthen the researcher's hypothesis that many of the Environmental Remediation companies started their businesses recently, which may have been caused by the Military Base Realignment And Closure (BRAC), the clean up of the Formerly Used Defense Sites (FUDS), and the Former Used Sites Remedial Action Program (FUSRAP) Sites.

2. Types of Remediation Work

The purpose of Question 13 was to determine the type of remediation work that each surveyed company performs. A few of the companies conducted more than one type of remediation work. Out of the 96 survey responses, 134 answers were given for the type of work performed. Table 4-2 illustrates the breakdown of the type of Environmental Remediation work performed by the companies.

As can be seen in Table 4-2, the majority of companies surveyed did soil Environmental Remediation services for the Department of Defense. Closely behind were Water Remediation and Other Materials Remediation. The largest recent

environmental hazard during BRAC has been soil remediation (Fort Ord 1991).

TABLE 4-2 TYPE OF REMEDIATION COMPLETED WITH THE DoD		
TYPE	NUMBER	PERCENTAGE
Soil	43	32%
Water	27	20%
Other Materials	25	19%
Other	20	15%
Air	11	8%
No Answer	8	6%
TOTAL	134	100%

Source: Developed by Researcher

Generally, when contractors submit their proposals, they are not sure what hazardous material they are going to find under the top layer of soil. This has occurred on numerous occasions especially during the military Base Realignment and Closure. This unknown factor increases risk for the Environmental Remediation contractor, which in turn increases the price of the contract. Generally businesses increase their price when there is increased risk. During BRAC, many military installations that had been in place for over half a century were told to close. The majority of these military installations did not have historians assigned to them. Commanders of military installations did not have a clear

picture of everything that had happened at their military installations over the past 50 years during the training of military personnel for World War I, World War II, the Korean War, and the Vietnam War.

3. Types of Remediation Contracts

The purpose of Question 14 was twofold. First it was to determine the breakdown of the type of contract which Environmental Remediation companies use to complete their remediation work. This question was also asked to find out the preferred type of contract for Environmental Remediation work.

Table 4-3 illustrates the breakdown of the type of contract the

TABLE 4-3 TYPE OF ENVIRONMENTAL REMEDIATION CONTRACT		
TYPE CONTRACT	NUMBER	PERCENTAGE
Fixed Price	463	56%
Cost-Reimbursable	207	25%
Time and Materials	145	17%
Other	9	1%
No Answer	8	1%
TOTAL	832	100%

Source: Developed by Researcher

DoD and the Environmental Remediation companies use to perform environmental clean up.

The researcher was quite surprised to find out that the Fixed-Price contract was used the most (56%). This was double the amount listed by the second type of contract most used by

the DoD and the Environmental Remediation Industry. It is believed that most of these Fixed-Priced contracts are relatively small. The large Total Environmental Remediation Contract (TERC) that the United States Army uses for Environmental Remediation clean up at places on the BRAC list such as Fort Ord in Monterey, California, is restricted from using Fixed-price, Time and Materials, and other contract type delivery orders. But a key objective in TERC acquisition strategy is to enhance the development of Small Business and Small and Disadvantaged Business (SB/SDB) firms in the HTRW industry (United States Army Corps of Engineers 1993). The Total Environmental Restoration Contracts encourages the chosen prime contractor to aggressively pursue the involvement of Small Business (SB) and Small Disadvantaged Businesses (SDB) in HTRW remediation projects. To achieve this, the TERC contractor may use a variety of subcontracting methods to include Fixed-Price and Cost-Reimbursement subcontracts.

The second part of Question 14 asks for the number of contracts awarded to Environmental Remediation companies. Apparently, some of the companies completing the surveys did not understand this question. Many of the companies merely put a 1 next to the contract type that is used in the performance of their Environmental Remediation contracts. This led the researcher to believe that the contractor either did not

understand the question or just skimmed over the question and then put a 1 next to their most common Environmental Remediation contract type. The majority of Environmental Remediation companies (56%) had Fixed-Price contracts, which again was double the amount listed by the second type of contract most used by the DoD and the Environmental Remediation industry.

D. ENVIRONMENTAL REMEDIATION COST CONTROL MEASURES

The purpose of Question 15 was to determine the type of controls each company has in place that help them keep costs competitive within their market. At this point, a separation of large and small companies must be made. The following questions will be broken down into large and small businesses. By using the Federal Acquisition Population (Federal Acquisition Regulation 1999), number of employees, and sales volume, the researcher determined that of the 96 responses to the survey, 18 were large companies, 76 were small companies, and 2 could not be determined.

1. Small Business Cost Controls

Of the 76 small businesses replying to this survey, 52 provided answers to the question of cost controls utilized within their companies that help them keep costs competitive within their market. Table 4-4 lists a few of the most common

types of controls used by small business Environmental Remediation companies. The control measures listed in Table 4-4 are ranked by the surveyed companies in the order of precedence, from highest to lowest.

TABLE 4-4	
SMALL BUSINESS COMMON COST CONTROLS	
CONTROL MEASURE	
Low Overhead	
Close Supervision from Managers and Program Managers	
Cost Controls on Materials	
Partnering	
Small Administration Staff	
Cost Comparisons on Labor, Salary Comparisons	
Stay Small and Efficient	
Hire Retirees for Specific jobs and Lay Off Between jobs	
Source: Developed by Researcher	

Most small businesses maintain a low overhead to remain competitive in their market.

2. Large Business Cost Controls

Of the 18 large businesses replying to this survey, 13 provided answers to the question of cost controls. Table 4-5 lists a few of the most common cost controls utilized by the large businesses. Again, the control measures listed in this

table are ranked in the order of precedence, from highest to lowest,

TABLE 4-5	
LARGE BUSINESS COMMON COST CONTROLS	
CONTROL MEASURE	
Closely examined budget	
Market Research	
Cost Control and Mgmt Systems Focused on Job Efficiency	
Market Driven Pricing Structure	
Reduced Overhead	
Detailed Review Process	
Competitive Bidding	
Long-Term Employees, Turnover is Almost Non-existent (Mature Employees)	
Cost Accounting Standards (CAS) Compliant	
Maintain State of the Art Equipment and Methods	
Effective Personnel	
Certified Matrix Management	
Source: Developed by Researcher	

given by the surveyed Environmental Remediation companies. Here it is easy to see the different cost controls methods used by small and large businesses. It appears that both try to keep costs low by closely examining their budget.

E. ENVIRONMENTAL REMEDIATION INDUSTRY CAPABILITIES

1. Small Business Capabilities

The purpose of Question 16 was to find out if specific companies had any capabilities that distinguished them from all

others in the Environmental Remediation industry. Table 4-6 lists a few of the most common type of capabilities used by small Environmental Remediation companies. Of the 76 small businesses replying to this survey, 53 provided answers to the question of capabilities that distinguishes them from all others in the Remediation Industry. Of the 53 companies answering this question, the most popular answer was the capability of having a large quality assurance system in place.

TABLE 4-6	
SMALL BUSINESS CAPABILITIES	
SMALL BUSINESS CAPABILITY	
Large Quality Assurance System in Place	
Specialize in a Specific Type of Remediation	
High Quality (Experienced people)	
Experience	
Small, Ability to Control Costs	
Treat all clients the same	
We offer special training to our clients (OSHA Cert, etc.)	
Responsive and flexible	
Source: Developed by Researcher	

2. Large Business Capabilities

Table 4-7 lists a few of the most common type of capabilities that large Environmental Remediation companies use. Of the 18 large businesses replying to this survey, 12 provided answers to the question of capabilities. The similarity between

large and small companies in this area is that they both specialize in a specific type of remediation and also that they both have superior past or present performance. Of the 12 companies answering this question, the most popular answer was the large business capability to perform specialized services.

TABLE 4-7	
LARGE BUSINESS CAPABILITIES	
LARGE BUSINESS CAPABILITY	
Specialized Services	
Superior Past Performance	
Variety of Services (Full Service)	
Capability of Producing Own Prototypes and Specialized Equipment (State of the Art)	
Many Patented Processes	
Many Offices Nationwide	
Large Staff with Experienced Folks and a Leader Who Has Networked with Teaming Partners	
Construction In-House	
Source: Developed by Researcher	

F. ENVIRONMENTAL REMEDIATION INDUSTRY WEAKNESSES

1. Small Business Weaknesses

The purpose of Question 17 was to determine the principal weaknesses that each company had in contracting with the Federal Government regarding the Environmental Remediation industry. Table 4-8 lists a few of the most common weaknesses that each small business in the survey had. Of the 76 small businesses replying to this survey, 43 provided answers to the question of

principal weaknesses. The principal weakness that small businesses listed was that they felt that they were too small to contract with the Federal Government.

TABLE 4-8	
SMALL BUSINESS WEAKNESSES	
SMALL BUSINESS WEAKNESSES	
Size Too Small	
Capital	
Don't know how	
Do not have time for all the Red Tape	
Overburdening Paperwork	
Do not have an Approved Accounting System	
Learning with each project, lack of experience	
Source: Developed by Researcher	

2. Large Business Weaknesses

Table 4-9 lists a few of the most common weaknesses that each large business had. Of the 18 large businesses replying to this survey, 12 provided answers to this question. The principal weakness that large businesses listed was that they were not large enough to contract with the Federal Government. Both the large and small Environmental Remediation companies felt that size was a weakness.

TABLE 4-9	
LARGE BUSINESS WEAKNESSES	
LARGE BUSINESS WEAKNESSES	
Size - not large enough	
Reluctance of proposing on contracts with no guaranteed meaningful work (i.e., ID/IQ Contracts)	
Knowledge of Federal Regulations and procedures	
Company has regional roots-has not expanded	
No DOD Experience	
Limited Professional Staff	
No Eligible for Small Business or Minority Status	
Not Certified Accounting System (CAS) Compliant	
Source: Developed by Researcher	

G. ENVIRONMENTAL REMEDIATION INDUSTRY STRATEGIES

The purpose of Question 18 was to determine the strategies used by companies to be successful in the Environmental Remediation industry.

1. Small Business Strategies

Table 4-10 lists a few of the most common strategies that each small business listed on their surveys. Of the 76 small businesses replying to this survey, 40 provided answers to this question.

TABLE 4-10	
SMALL BUSINESS STRATEGIES	
SMALL BUSINESS STRATEGIES	
	Use of a Website - obtaining solicitations before they are out for bid through the internet.
	Customer Orientated
	Teaming
	Stress Small Business Consideration
	Encourage Long term relationships with contractors
	Direct Marketing
	Specialty Services
	Active in Associations, Trade Journals and Conferences
	Quality Performance
	Control of Costs
Source: Developed by Researcher	

2. Large Business Strategies

Of the 18 large businesses replying to this survey, 13 provided answers to this question. Table 4-11 lists a few of the most common strategies that each large business had. Both large and small companies listed Teaming and Partnering as a business strategy. Also small businesses stated that one of their strategies was to perform quality performance on their contracts, while large businesses stated that they also had a focus on quality.

TABLE 4-11	
LARGE BUSINESS STRATEGIES	
LARGE BUSINESS STRATEGIES	
Focus on Quality	
Partnering	
Matrix Management	
Utilizing Subcontractors	
Work intimately with customers	
Bidding only on Fixed-Price Contracts	
Shifting out into Commercial and Agricultural sectors	
Source: Developed by Researcher	

H. KEY PROBLEMS IN ENVIRONMENTAL REMEDIATION CONTRACTS

The purpose of asking Question 19 was to determine key problems each company had in the performance of Government Environmental Remediation contracts.

1. Small Business Problems

Table 4-12 lists a few of the most common problems that each small business had in the performance of Government Environmental Remediation contracts. Of the 76 small businesses replying to this survey, 44 provided answers to this question.

TABLE 4-12	
SMALL BUSINESS PROBLEMS	
SMALL BUSINESS PROBLEMS	
Lack of technical capability within the Government Contracting Office	
Payment Delays	
Have not contracted with the Government	
Too much Red Tape	
Changing Requirements	
Required Bonding for service type contracts	
Different Interpretation of Contract Requirements	
Out of Date Specifications (Tied to Outdated and old Regulations)	
Source: Developed by Researcher	

The primary problem listed for small businesses was the lack of technical capability within the Government contracting office.

2. Large Business Problems

Table 4-13 lists a few of the most common problems that each large business had in the performance of Government Environmental Remediation contracts. Of the 18 small businesses replying to this survey, 12 provided answers to this question.

The similarities between the large and small companies are that both types of Environmental Remediation companies list payment delays as a problem with the performance of Government Environmental Remediation contracts.

TABLE 4-13

LARGE BUSINESS PROBLEMS

Too Much Paperwork
Payment Delays
Government inability to move at the rate of business
Excessive and Antiquated Regulations and Terms and Conditions
Long delays between end of project and start of next project
Government Bureaucracy
Inability to be flexible
Unwritten Change Orders
Source: Developed by Researcher

I. VOLUME OF BUSINESS TRENDS

The purpose of Question 20 was to get a feel for the Environmental Remediation industry. The researcher wanted to find out if the surveyed results from the industry were different from the background investigation conducted by the researcher. The first part of the question was stated as follows: "Compared to 10 years ago, has the volume of business in the Environmental Remediation Industry increased, decreased, or stayed the same?" The results of the survey showed that the same number of companies surveyed (36%) felt the volume of business within the Environmental Remediation industry was increasing and also decreasing. Figure 4-1 shows a graphical representation of the number and the percentage of companies

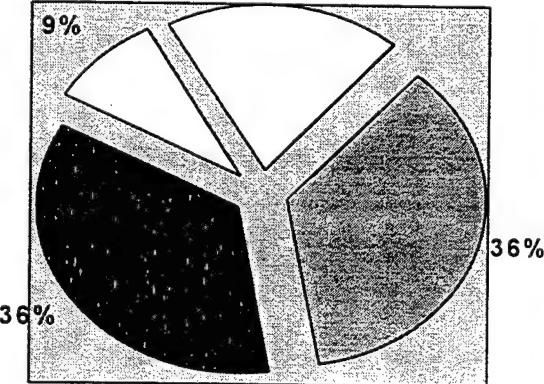
that felt the volume of business within the Environmental Remediation industry was either increasing or decreasing.

1. Small Business Trends

Of the 76 small businesses replying to this survey, 32 provided answers to this question. Figure 4-1 describes the results of this question. Based on the answers of the survey, many companies had differing opinions. About half of the respondents said that the industry was increasing. Almost half of the respondents said that the industry was getting smaller. About 10% of the respondents stated that the industry had not changed and had remained about the same size. The researcher was surprised that almost 20% of the respondents did not answer this question.

FIGURE 4-1
ENVIRONMENTAL REMEDIATION INDUSTRY TRENDS

19%



- Increased
- Decreased
- Stayed Same
- No Answer

Source: Developed by Researcher

The second part of Question 20 asked the respondents why they felt their Environmental Remediation company was either getting larger or smaller. Table 4-14 lists a few of the most frequently answered reasons that small businesses felt the Environmental Remediation industry was growing. The main reason the small businesses felt that the industry was increasing was more exposure awareness and public interest. A few list that growth was based on recent environmental hazards.

TABLE 4-14	
SMALL ENVIRONMENTAL REMEDIATION BUSINESS TRENDS - INCREASED	
SMALL BUSINESS FELT TRENDS INCREASED BECAUSE:	
More Exposure Awareness, Public Interest	
DOD Downsizing and the Base Realignment And Closure (BRAC)	
Insurance Company Interests	
Industry and Sites Maturing	
Volume Increased	
More Stringent Safety Standards	
Proliferation of EPA Regulations	
Source: Developed by Researcher	

Table 4-15 lists a few the most frequently answered reasons why the small businesses feel that the industry is decreasing in number. The primary reasons were the small businesses felt that there was less Government Enforcement of the environmental laws and relaxed standards by the regulator agencies.

2. Large Business Trends

Of the 18 large businesses replying to this survey, 11

TABLE 4-15

SMALL ENVIRONMENTAL REMEDIATION BUSINESS TRENDS - DECREASED

SMALL BUSINESS FELT TRENDS DECREASED BECAUSE:

Less Government Enforcement

Regulation agencies have relaxed their standards

Money and Budgeting has decreased

Increased Competition and Consolidation

Commercial Companies are focusing on low price rather than quality

Lack of additional regulations from the EPA

Contract Consolidation

Source: Developed by Researcher

provided answers to this question. Table 4-16 lists a few of the reasons that large businesses feel that the industry is increasing.

Large businesses felt that Public Activism and more

TABLE 4-16

LARGE ENVIRONMENTAL REMEDIATION BUSINESS TRENDS - INCREASED

LARGE BUSINESS FELT TRENDS INCREASED BECAUSE:

Public Activism

More problems create more recognition

Government Funding made available for Remediation and Clean Up

Defense Base Realignment and Closure (BRAC)

Tremendous Growth Market

Contracts tend to be moving from Architecture and Engineering into the Remediation Stage

Source: Developed by Researcher

problems were the biggest reasons that their businesses were increasing in size.

Table 4-17 lists a few of the reasons that large businesses feel that the industry is decreasing. Both large and small businesses feel the reason their businesses are decreasing has

TABLE 4-17	
LARGE ENVIRONMENTAL REMEDIATION BUSINESS TRENDS - DECREASED	
LARGE BUSINESS FELT TRENDS DECREASED BECAUSE:	
Less Regulatory Enforcement	
Regulations decreased	
Better Construction	
Source: Developed by Researcher	

to do with less regulatory enforcement and decreased regulations.

J. SUMMARY

The researcher has shown a breakdown of the results of part II of the survey received from 96 Environmental Remediation companies. The results of Part II of the survey were separated by large and small companies. Chapter V provides an in-depth analysis of the results of the survey. It breaks down the survey results into large and small Environmental Remediation companies. Chapter VI discusses conclusions and recommendations for the DoD in dealing with the Environmental Remediation Industry.

V. DATA ANALYSIS

A. INTRODUCTION

The previous four chapters were devoted to presenting the background, definitions, laws, regulations, and survey data. This chapter analyzes, in depth, the survey data presented in Chapters III and IV. The main focus of this chapter is to analyze and summarize the survey questions and their answers. It will also note where the size of an Environmental Remediation Company influenced answers.

Section B analyzes the results from Part I of the survey that were presented in Chapter III. The analyzation of these results will give a clearer picture of the surveyed population demographics.

Section C examines the 10 survey questions from Part II of the survey, which were presented in Chapter IV. This section will determine differences between large and small company responses, specifically those that pertain to the Environmental Remediation Industry and then discuss the importance of these differences.

Section D discusses four questions from the overall survey results where size of the company did not affect the answers to the survey for large and small companies. Section E examines

four questions in which the size of the company did matter. Section F summarizes this chapter and then introduces Chapter VI.

B. ANALYSIS OF PART I OF THE SURVEY

Part I of the survey consists of the first 11 questions. The results of these questions were received from 96 Environmental Remediation Companies. Question 1 of the survey asked, "What is the primary product or service of your company?" As noted earlier, Environmental Remediation Companies normally remove hazardous waste and petroleum products from ground water, soils, and air. The overwhelming response from the companies surveyed was that they classify themselves as "Environmental Remediation" companies. Other types of companies listed included: Construction, Civil/Environmental Consulting, Engineering Services, Environmental and Geotechnical Engineering Services, Environmental Consulting, and Engineering Services.

Question 1B of the survey asked the companies whether they provided goods or services to the industry. Eighty-eight percent of the companies surveyed reported that they provided services. Only 10% answered that they provided goods, and 2% had no answer. These responses verify that the majority of Environmental Remediation Companies are service oriented and do not provide goods. Generally, Environmental Remediation work is

considered a service rather than a good. Environmental Remediation Companies do not provide goods; they do clean up work, thus providing a service. These survey responses verify this generalization.

Question 1C asked, "What is your primary Standard Industrial Classification (SIC) Code?" Thirty-two percent of the companies surveyed answered SIC code 8744, "Engineering, Accounting, Research, Management and Related Services, Facilities Support Management Services." This industrial code is for companies engaged primarily in furnishing a range of services for the remediation of a contaminated environment to an acceptable condition including, but not limited to, preliminary assessment, site inspections, testing, remedial investigation, feasibility studies, remedial design, containment, remedial action, removal of contaminated materials, storage of contaminated materials, and security of site closeouts.

Question 1D was concerned with whether the company is publicly or privately held. If a company is publicly held, the government or local community owns the company. If a company is privately owned, then it is owned by a private person or business. Of the companies surveyed, 95% of the companies were privately owned.

Question 2 asked the companies how many years they had been in existence. Of the companies surveyed, 30% had been in

existence from 6-10 years, with over 50% being in existence for less than 10 years. These results support the researcher's hypothesis that most Environmental Remediation Companies started business after the start of the military drawdown 10 years ago.

Question 3 asked the surveyed Environmental Remediation Companies about the number of employees in their organization. The largest number of employees was 1-19, with 44% of the companies indicating this choice. Over 50% of the companies surveyed had less than 49 employees, which may be a result of many Environmental Remediation Companies hiring temporary specialists to complete a job. These specialists are site specific and are generally laid off between jobs. Many of these workers are retired and enjoy working for a company until a job is complete and then wait until the next job comes along. They have a good working relationship with the Environmental Remediation Companies.

To get a better idea and to answer one of the thesis' secondary questions, question 4 asked where employees are primarily located. This question was worded so as to distinguish between whether employees work at the site where they clean up the environmental hazard or if they work near their home office and travel to the remediation site. By looking at Figure 3-1 in Chapter III, it is easy to see that company headquarters are actually located in states that have

the strictest environmental laws in the nation. The seven states that have the most Environmental Remediation Companies are California, Colorado, Virginia, Florida, Texas, Ohio and Georgia.

Referring to Lester's Capacity/Motivation Model in Chapter II, California and Florida are considered Progressives, which are states that combine a high degree of environmental commitment with strong institutional capacity. They have the motivation and capacity to enforce stringent environmental standards. These are the states that will fully enforce Federal standards, and they will likely add additional state environmental standards in many areas. Colorado is considered a Struggler, a state which has a high degree of commitment and motivation but with limited institutional capacities. Georgia, Ohio, Texas, and Virginia are considered Delayers. Delayers are states that have the institutional capacity to support a strong environmental program, but lack the commitment to go beyond Federal standards.

The responses to this question assist in answering one of the researcher's subsidiary thesis questions about patterns or trends regarding the nature of the Environmental Remediation Industry during the past 10 years. The answers suggest that Environmental Remediation Industries base their headquarters in states with the strictest environmental laws. Therefore,

Environmental Remediation Companies receive more business in these states because of their stricter environmental laws.

Question 5 asked the surveyed companies what their approximate annual current sales volume was. The majority of companies answered that their current sales volume was between \$1 million and \$5 million. The second most popular reply was an annual sales volume of between \$10 million and \$50 million. These two answers account for the two different types of companies in Environmental Remediation—small business and large firms.

Small businesses are defined by the Small Business Administration (SBA) and also by the Federal Acquisition Regulation (FAR). Small businesses, according to the Standard Industrial Classification (SIC) Code of 8744, "Engineering, Accounting, Research, Management and Related services, Facilities Support Management Services," are companies with an annual sales volume of under \$17 million. Large companies have sales volumes of over \$17 million.

Question 6 asked, "What is the approximate total value of all active contracts you have with the DoD?" The majority of contractors (30%) answered that their contracts with the Department of Defense were under \$500. And the second most common answer was greater than \$5 million, with 21% of companies answering this way.

It is obvious that these results reflect the two types of Environmental Remediation Companies in this survey, large and small Environmental Remediation Companies. Generally, the larger companies do the majority of the Environmental Remediation work within the industry. Small companies perform primarily subcontracting work in specialized environmental remediation areas or fields.

Perhaps this disparity in responses may have resulted from many of the small companies misunderstanding this question. Many small companies have subcontracts that are mandated by the U.S. Government and the Federal Acquisition Regulation (FAR) within the prime contractor Environmental Remediation Company subcontracting plans. In many contracts, small companies might feel they work for the larger companies, when in fact they are subcontracted to do work for the Department of Defense. If this is the case, small businesses should have answered that many more of their subcontracts are with the Department of Defense. A possible misinterpretation of this question affects the interpretation of the results.

Question 7 was concerned about what percentage of the surveyed companies' business was with the U.S. Government? The majority, 34% of the companies answered that they did less than 5% of their business with the U.S. Government. The second most common answer, 21% of the survey results, were from companies

that did between 51-75% of their business with the U.S. Government.

The disparity in these results may be due to the same reasons as the disparity of the results in the previous question. The small businesses probably did not count all the business that they do as a subcontractor that is mandated by the Government. The future for small Environmental Remediation Companies is looking bright because of the continued Base Closure and Realignment (BRAC) process and the forecast that over the next 20-30 years, Federal, state, and local governments along with the private industry, will commit billions of dollars annually to clean up sites contaminated with hazardous waste and petroleum products.

Question 8 asked the surveyed Environmental Remediation Companies whether foreign sales made up a significant portion of their sales. The main reason for this question was to determine if Environmental Remediation Companies supplemented their income with foreign business. The overwhelming majority of companies, over 90%, answered "No" to this question. The responses to this question illustrate two things-first, there is enough business in the United States so companies do not have to look abroad for more business; and second, the majority of the surveys came from small businesses that probably do not have the necessary experience, expertise, or training to conduct Environmental

Remediation services with a foreign country. Environmental Remediation Companies listed one of their weaknesses in question 17 as a limited professional staff that had a difficult time with the overburdening paperwork and red tape of doing business with the Government. Dealing with foreign governments would involve the same difficulties, with more paperwork along with red tape, to conduct business. The bottom line is that only 4% of the businesses surveyed actually carried on business with foreign governments.

Question 9 of the survey asked, "In addition to the contractual work you have with DoD, do you perform a substantial amount of work as a subcontractor for another company performing on a government contract?" The answers to this question were very close. To get a clearer picture of how close the results of this question were, the companies that did not reply to this question were discounted. The results were that 54% answered "Yes" and 46% answered "No."

If small businesses do less than 5% of their business with the U.S. Government as stated in question 7, how then could over 50% of these companies do a substantial amount of their work with the U.S. Government as stated in question 9? The answers to this question verify that the Environmental Remediation Companies which answered question 7 must have misunderstood this question. By simply doing the math, this response states that

over 54% (45 companies) of the surveyed do subcontract work for companies performing contracts with the United States Government. By comparing these two questions, the companies either misunderstood question 7 or they misunderstood question 9. A lot of subcontract work goes on in the Environmental Remediation Industry; therefore, the question that was misunderstood was probably question 7, which asked what percentage of the Environmental Remediation Companies business was with the U.S. Government. The surveyed companies must have only counted the contracts that they had directly with the U.S. Government and not the contracts that they had subcontracted with larger companies for the U.S. Government.

Question 10 asked whether the companies classified their industry position as a Monopoly, an Oligopoly, or Full Competition? The main purpose for asking this question was to determine the economic environment within which the Environmental Remediation Companies operate. Businessmen would expect to see an open free market in the remediation business. The majority of the answers, 97%, indicated that the market is controlled by Full Competition. Because only one company that performed environmental remediation stated they were a Monopoly and two companies stated they were an Oligopoly, which was also a small business performing environmental remediation, both of these answers were discounted as the result of an Environmental

Remediation Company employee who did not understand this question. But with 97% of the surveyed companies listing themselves as Full Competition, it is easy to see that the majority of the industry is competing in a full competition market.

Question 11 asked whether the U.S. Government recognizes your company as a small business. This question was critical to the primary thesis question about the nature of the companies involved in the Environmental Remediation Industry. It also assists with answering a secondary thesis question about one of the critical elements of the environmental remediation supplier base, which can be analyzed to gain an understanding of the nature of these companies. The overwhelming majority of companies, 79%, stated that they were recognized as a Small Business.

The second part of question 11 was concerned with whether the Government recognizes the Environmental Remediation Company as an 8a, Women Owned, Veteran, Small Disadvantaged Business, or other type business. The majority of these companies (33%) answered that they are recognized as a Small Disadvantaged Business, while 30% answered that they were recognized as an 8a firm, but they failed to classify themselves as Women Owned, Veteran, or Small Disadvantaged Businesses. Through research, it was found that the majority of companies in the 96 surveys

were small business companies. In April 1999, the Principal Assistant Responsible for Contracting (PARC) for the U.S. Army Corps of Engineers stated that numerous qualified small businesses are capable of performing high-dollar procurements under SIC 8744. She went on to say that at least 10 Environmental Remediation firms have annual revenues of \$20 million to almost \$100 million (U.S. Army Corps of Engineers, 1999, p.24). The Naval Facilities Engineering Command, Pacific Division, has already set aside for small businesses a \$50 million requirement for Clearance of Unexploded Ordnance and Environmental Restoration Worldwide. The fact that numerous high-dollar requirements are already being successfully performed by small businesses under SIC 8744 is clear evidence that small businesses are willing and able to perform these type of procurements for the Department of Defense. An example of the type of procurements under SIC 8744 that are already being performed by small businesses include:

- U.S. Army Corps of Engineers, Kansas City, MO., Site Specific Environmental Remediation Contract for \$50 million;
- U.S. Army Corps of Engineers, Kansas City, MO., for two contracts with a joint total acquisition value of \$100 million;

- U.S. Department of Interior Bureau of Reclamation, Upper Colorado Regional Office, for \$98 million;
- U.S. Environmental Protection Agency, Region 2, with an approximate value of \$300 million;
- U.S. Air Force Center for Environmental Excellence, \$475 million; and.
- National Guard, \$590 million Manpower Requirements Criteria Contract (MARC), which will be awarded this summer.

The list above shows another example of how the Government supports Federal socioeconomic programs such as Small Businesses. The Small Business Administration aids the Federal Government by enforcing laws and setting minimum goals for many Government organizations.

To summarize Part I of the survey, based mainly on this survey questionnaire, industry publications, and interviews, the Environmental Remediation Industry is made up of companies with the Standard Industrial Classification (SIC) Code of 8744, Engineering, Accounting, Research, Management and Related Services, Facilities Support Management Services. Their businesses provide primarily services and are privately owned. The average company has been in business for less than 10 years, with approximately 1-19 employees. The average company has an annual sales volume of between \$1 million and \$5 million and has

a total value of all active contracts with the U.S. Department of Defense of either under \$500 or more than \$5 million. Only 4% of the companies do business with foreign governments and approximately half of the companies do subcontracting work. Ninety-seven percent of the industry classifies their company industry position as full competition. Of the companies surveyed, 79% of the companies are small businesses, with the majority of them being classified as an 8a firm.

C. ANALYSIS OF PART II OF THE SURVEY

This section of Chapter V analyzes Part II of the survey, which comprises 10 questions.

Question 12 of the survey asked, "How many years have you had Department of Defense contracts for remediation effort?" More than 34% of companies that answered the survey questions stated that they had conducted contracts with the DoD for less than a year. By grouping the answers to this question together, 66% of the companies have had contracts with the Department of Defense for less than 10 years, while only 15% of the surveyed companies have had contracts with the Department of Defense for more than 10 years. These results indicate that many of the Environmental Remediation Companies had begun their business based on the environmental remediation work needed at Military Base Realignment and Closure (BRAC) sites, the cleanup of

Formerly Used Defense Sites (FUDS), and the Former Used Remedial Action Program (FUSRAP). The results strengthen the hypothesis of this thesis.

Question 13 asked about the type of remediation work the companies had completed with the Department of Defense. Over 30% stated that they conducted soil remediation, with water remediation and other materials remediation coming in a close second. Currently soil remediation makes up the majority of the remediation work in the United States. The Federal Government is the biggest violator of the current U.S. Environmental Laws. The top 65 environmental remediation sites listed to be cleaned up are located on Government installations, which are exempt from Federal environmental laws. The estimated cost to clean up these 65 sites is approximately \$6 billion (Harvey, 1999). Many Environmental Remediation Companies tend to specialize in certain environmental remediation fields.

Question 14 asked the surveyed companies what type and how many contracts do you have with the Department of Defense. The majority of contracts from the surveyed companies were Fixed-Price, with over 463 contracts and 56% of the surveyed companies; Cost-Reimbursement contracts was next with 207 or 25% of the surveyed companies. Generally Environmental Remediation Contracts are cost-reimbursement type contracts. Many small businesses subcontract with larger companies with Firm Fixed-

Price (FFP) contracts for environmental remediation. This would explain why the majority of contracts in this survey were FFP contracts.

Question 15 asked the surveyed Environmental Remediation Companies regard the controls they have within their companies that help keep their costs competitive within the environmental remediation market. Beginning with question 15, small and large Environmental Remediation Companies began to give very different answers according to their size. At this point, the answers were broken down by company size. Of the Environmental Remediation Companies that were surveyed, the small companies answered that their controls involved the following: low overhead, close supervision from managers and program managers, cost controls on materials, partnering, and small administration staffs. The small companies also hired retirees for specific jobs and laid them off between jobs.

The large Environmental Remediation Companies answered with the following: they closely examined their budget, did market research, used cost control and management systems focused on job efficiency, used a market driven pricing structure, reduced overhead, detailed review bidding and competitive bidding. Both small and large companies made a concerted effort to keep costs low by closely monitoring the budget of the project.

Question 16 asked the surveyed companies whether they had any capabilities that distinguished them from the rest of the Environmental Remediation Industry. Small companies listed that they had large quality assurance systems in place, they specialize in a specific type of remediation, maintained high quality by hiring experienced people, and remained small which helped control costs. Controlling cost is a critical element for small businesses, especially when large businesses are hiring subcontractors using Firm Fixed-Price contracts.

Large companies answered the same question differently. The large Environmental Remediation Companies answered that they have specialized services, superior past performance, the capability of producing their own prototypes and specialized equipment, many patented processes, and many offices nationwide.

Question 17 asked the Environmental Remediation Companies about their principal weaknesses in contracting with the Federal Government regarding environmental remediation. The small companies answered that they felt that they were too small, did not have enough capital to compete, many times did not know how to conduct business with the United States Government, did not have time for all the red tape and overburdening paperwork, and did not have a Government-approved accounting system. The large companies responded that they were also not large enough to do all the jobs that the Government wanted them to do. They

answered that were reluctant to turn in proposals on contracts with no guarantee of any meaningful work. They were not familiar with Federal regulations and procedures and did not have Department of Defense experience. These large companies operated with a limited professional staff. They also felt it a disadvantage that they were not eligible to compete as a small business or with a minority status.

For these companies, there may be help on the way. The Deputy Secretary of Defense, Dr. John J. Hamre, has directed that each Service implement a paperless contracting process by 1 January 2000. The goal of the paperless contracting initiative is to eliminate all DoD internally required nondigital transactions (e.g., paper documents, forms, reports) from the DoD contracting process. The paperless effort will focus on that portion of the contracting continuum that encompasses the requirement's definition through contract closeout to include interfaces with the logistics, finance, and administrative communities.

The Army's visionary concepts of paperless acquisition are to acquire supplies, equipment, and services necessary to support Army XXI. The goal is to harness current technology to create an electronic infrastructure requiring no paper documentation. The Army's implementation plan lays a basic foundation for a paperless contracting system. A Working

Integrated Product Team (WIPT) will define the exact processes, initiatives, and measurements of success that will lead the Army to a paperless contracting environment. The WIPT will establish the Army's master plan for implementing paperless contracting. It will monitor initial Army-wide implementation and report metrics on progress. An Army Project Office will be established to manage implementation throughout the Army (Hooks, 1998, p. 51).

The approval of this process has been slow in getting through the legal channels for many reasons. Chief among them are that the Federal Acquisition Regulation (FAR) does not address offer and acceptance in the electronic environment, nor does it discuss the use of specific forms. Another reason is that there would be no signature required on paper; the signature would be an electronic version via the Internet. Without a hard copy, signed by both parties, is it legal and binding? If paperless contracting were enforced, it would lessen the burden placed on Environmental Remediation Companies, large and small.

Question 18 asked the surveyed companies what strategies they used in the industry. Small businesses stated that they used Web sites, were customer oriented, stressed teaming and direct marketing, and encouraged long-term relationships with contractors. They also performed many specialty services and

remained active with environmental remediation associations, trade journals, and conferences. The large companies answered that they focused on quality, partnering, matrix management, utilizing subcontractors, and working intimately with their customers.

Question 19 asked about the key problems that the companies had in the performance of Government remediation contracts. The problems encountered by small companies included a lack of technical capability within the Government contracting office, many payment delays, very little experience contracting with the Government, too much red tape, too many changing requirements, and Government requirements for bonding for service type contracts. Small businesses rely on progress payments to remain in business. The U.S. Government is notorious for late payments, a practice that puts small businesses in jeopardy. This distracter in itself limits the number of small businesses in competition for Environmental Remediation Contracts, which in turn limits competition and eventually raises prices. Large Environmental Remediation Companies answered that they had problems with too much paperwork; the Government's inability to move at the rate of business; excessive and antiquated regulations, terms, and conditions. Large businesses also listed delayed payments as a key problem. They stated that

there were long delays between the end of the project and the start of the next project.

Question 20 asked each company, when compared with 10 years ago, has the volume of business in the Environmental Remediation Industry increased, decreased, or stayed about the same, and why. Of the 76 small businesses that replied to this question, the response to whether the volume of business is increasing or decreasing was actually tied with 36%. Small businesses felt that business was increasing because of heightened public interest in, more exposure to and awareness of the environment, DoD downsizing along with Defense Base Realignment and Closure (BRAC), industry and sites maturing, more stringent safety standards, and a proliferation of Environmental Protection Agency (EPA) rules. The reasons small companies felt that the industry was getting smaller included Government enforcement, decreased environmental money and budgeting, increased competition and consolidation, and a lack of additional EPA Regulations.

The responses from the 18 businesses that answered the question about the volume of business were evenly divided between increasing or decreasing. The large businesses that felt the industry was decreasing thought the change was due to less regulatory enforcement, a decrease in environmental regulations, and better construction methods. The large

businesses that felt the industry was increasing gave the following reasons: public activism, more problems that have created more recognition, increased Government funding for remediation and clean up, Defense Base Realignment and Closure (BRAC), and a tremendous growth market.

To summarize Part II of the survey, the Environmental Remediation Industry is made up of companies that have conducted contracts with the Department of Defense an average of five years. The companies have conducted remediation work primarily on soil, but also on water, air, and other materials. The majority of contracts conducted with the Department of Defense were Firm Fixed-Price (FFP), with cost-reimbursement coming in a close second. The majority of the Environmental Remediation Companies had controls in place to keep their costs competitive within their market. Small and large companies had their own type of controls. Small Environmental Remediation Companies used low overhead, small administrative staffs, close supervision from managers, partnering, cost controls on labor and materials, and attempted to remain small and efficient. The cost controls used by the large Environmental Remediation Companies included market research on materials, cost controls focused on job efficiency, reduced overhead, competitive bidding, and maintaining state of the art equipment and methods.

Each company also had capabilities that distinguished them from their competitors. The capabilities used by the small Environmental Remediation Companies included a large, quality assurance system; specialization in a specific type of remediation; high-quality personnel; and experience. The capabilities used by the large Environmental Remediation Companies were also a specialized service, superior past performance, many patented processes and a large staff. The large Environmental Remediation Companies also used a variety of environmental services, which they used to consider themselves a full service remediation company.

The weaknesses of small companies were that they were too small and did not have enough capital to compete. They did not know how to compete for Federal Government contracts. Small Businesses felt there was an overburdening amount of paperwork involved with submitting a proposal. The weaknesses of the large Environmental Remediation Companies were that they felt they were not large enough to do all the jobs they wanted to do. They also felt they did not know all the Federal regulations and procedures and did not have DoD experience. Strategies used by the companies were to be customer oriented; use a Web site for obtaining solicitations; teaming; long-term relationships with contractors; focus on quality; and remain active in associations, trade journals, and conferences. Problems

encountered by both large and small companies were payment delays and too much red tape conducting business with the Government. Another problem stated by many of those surveyed was the Government's inability to move at the rate of business.

Within the industry, there appeared to be confusion over whether the industry was getting larger or smaller. The number of companies that felt that the Environmental Remediation Industry was getting larger was about the same as companies that felt it was getting smaller. The main reasons the companies gave for the industry getting larger were more public awareness, DoD downsizing and the Military Base Realignment and Closure (BRAC) process, and more stringent safety standards. Some companies felt that the industry was getting smaller because the Federal environmental budget was getting smaller, contracts were being consolidated, and regulation agencies had relaxed their standards.

The next section will analyze four areas where the size of the Environmental Remediation Company did not make a difference in the answers to this survey.

D. ANALYSIS OF SURVEY QUESTIONS WHERE SIZE DID NOT MATTER

Of the businesses that answered the survey questions, there were a few questions whereby the small and large businesses answered similarly. While it was anticipated that there would

be differences in the answers in the following areas, the answers were actually quite similar. The areas that were analyzed and determined to have very few differences included: 1. Dependence on the Government, 2. Environmental Remediation business trends, 3. Subcontracting, and 4. Environmental Remediation business weaknesses.

1. Dependence On The Government

This question was asked to determine the amount of dependence Environmental Remediation Companies had on the Government for their business. Question 7 of the survey asked, "What percentage of your business is with the U.S. Government?" The assumption was that the majority of small businesses depended more on the U.S. Government than on their local economy for their environmental cleanup business. In an effort to support the socioeconomic goals of the Government, the Federal Acquisition Regulation (FAR) requires most Government agencies to have Small Business Set-Asides goals for small businesses.

There are two types of small business set-asides. The first is total Set-Asides, which means that the total amount of the acquisition must be set aside. The second type of small business set-aside is called Partial Set-Aside, which means that a portion of the acquisition must be set aside. Each organization is required to set goals for small and

disadvantaged businesses. Public laws established an objective for the DoD of awarding a combined total of 5% of its total contract dollars during each fiscal year to small disadvantaged business concerns, historically black colleges and universities and minority institutions. In addition to the above requirement, any contractor receiving a contract for more than the simplified acquisition threshold (SAT) in FAR Part 13 shall agree in the contract that small businesses and small disadvantaged businesses shall have maximum practical opportunity to participate in contract performance. To enforce these regulations, if a contract exceeds \$500,000 (\$1 million in construction) awarded to large businesses that offer subcontract possibilities, the contractor must submit a subcontracting plan for approval by the contracting officer and the Small Business Administration (SBA) representative. Table 5-1 shows the results of the survey.

An assumption was that many Environmental Remediation businesses would have a higher percentage in the category of "Greater than 50%" of the company's business with the U.S. Government. Table 5-1 reveals that only 32% of the companies do more than 50% of their business with the U.S. Government while over 60% of the companies surveyed did less than 50% of their business with the U.S. Government. This question in the survey

shows that businesses do not rely mainly on the U.S. Government for the majority of their business.

TABLE 5-1		
PERCENTAGE OF BUSINESS WITH THE U.S. GOVERNMENT		
AMOUNT	NUMBER	PERCENTAGE
<5%	32	34%
5%-25%	17	18%
26%-50%	11	11%
51%-75%	20	21%
Nearly All Business with U.S. Gov.	11	11%
No Answer	5	5%
TOTAL	96	100%

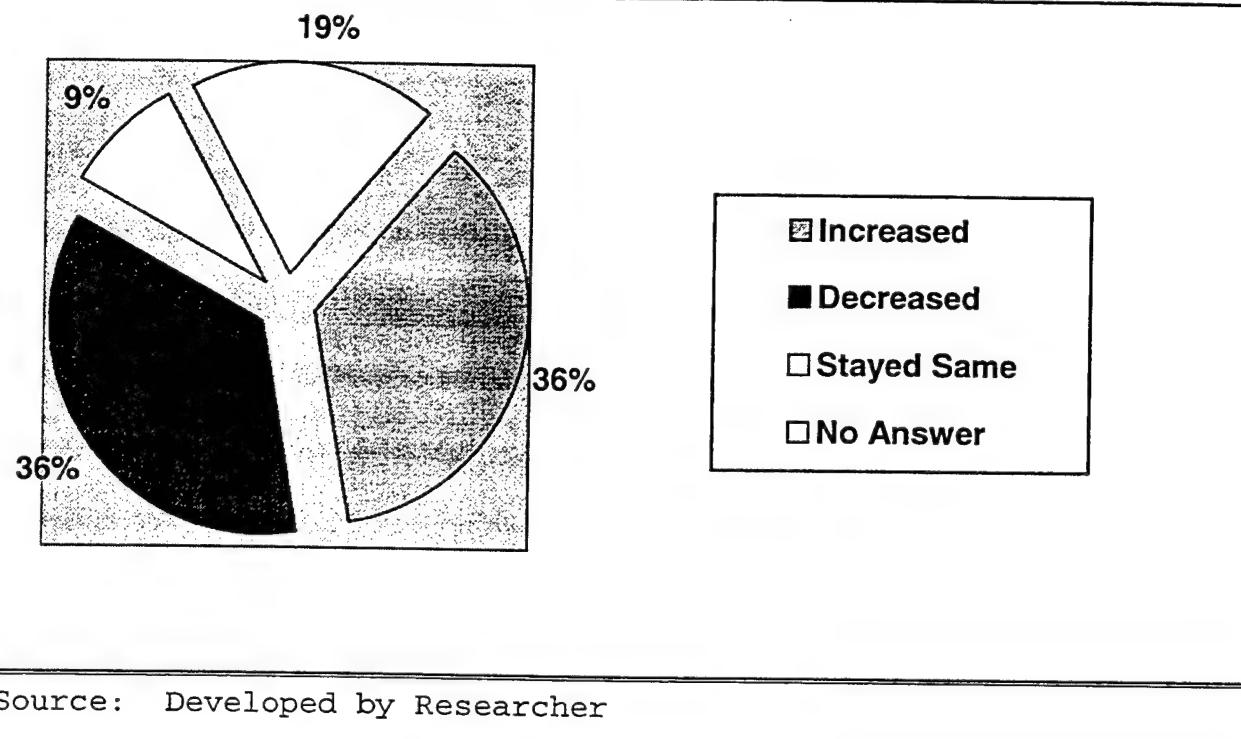
Source: Developed by Researcher

2. Environmental Remediation Business Trends

Question number 20 asked the surveyed Environmental Remediation Businesses: "Compared to ten years ago, has the volume of business in the Environmental Remediation Industry increased, decreased or stayed about the same?" The purpose of question 20 was to determine whether the Environmental Remediation Industry surveyed results from the industry were different from the previously conducted background investigation. The results of the survey showed that the same number of companies surveyed (36%) felt the volume of business within the Environmental Remediation Industry was increasing as well as decreasing.

Chart 5-1 shows a graphical representation of the number and the percentage of companies that felt the volume of business within the Environmental Remediation Industry was either increasing or decreasing.

Figure 5-1
ENVIRONMENTAL REMEDIATION INDUSTRY TRENDS



Based on answers to the survey, many people had differing opinions. About half of the respondents said that the industry was increasing. Almost half of the respondents said that the industry was getting smaller. About 9% of the respondents stated that the industry had not changed and had remained about

the same size. Though this question was thought to have been one of the easiest questions to answer, almost 20% of the respondents did not answer this question.

The second part of question 20 asked the respondents why they felt their Environmental Remediation Company was either getting larger or smaller. The most common answers from small environmental remediation businesses on why they felt the industry was getting larger are: the industry has more exposure awareness and public interest, the DoD downsizing and Base Realignment and Closure (BRAC) process, insurance company interests, and industry and sites maturing. The companies also listed an increase in volume as a reason for the industry increasing. This volume increase refers to a more common awareness of environmental hazards to the public. Other answers from smaller companies with little experience included more stringent environmental safety standards and a proliferation of Environmental Protection Agency (EPA) Regulations. The most common answer from large environmental remediation businesses on why they felt the industry was getting larger is because of a more visible public awareness based on environmental accidents. They felt that more problems create more recognition. Government funding has been made available for remediation cleanup and there exists a tremendous growth market because of the Military Base Realignment and Closure and contracts that

tend to be moving from architecture and engineering into the remediation stage.

Both large and small Environmental Remediation Companies also felt that the industry was getting smaller. The reasons that small companies felt that the industry was getting smaller were because of less Government enforcement and regulation agencies having relaxed their standards. They felt that money and budgeting have decreased while competition and the consolidation of contracts has increased. They also felt that commercial companies are focusing on low price rather than quality and that there is a lack of additional EPA regulations. Small companies believe that the Government is reducing it's budget and getting smaller. They also felt that with a smaller Government, that environmental enforcement regulations were getting fewer and fewer. With fewer regulations, there would be less enforcement, which would translate to fewer environmental remediation contracts.

Of the 18 large businesses replying to this survey, 11 provided answers to the question of compared to 10 years ago, has the volume of business in the Environmental Remediation Industry increased, decreased or stayed the same? The larger Environmental Remediation Companies feel that the industry is getting smaller because of less regulatory enforcement, a decrease in EPA regulations, and better construction methods.

3. Subcontracting

It was assumed that small businesses usually subcontract from a large company to do a project. As stated previously, to promote its socio-economic goals, the U.S. Government actually requires large businesses to have small business subcontracting goals. In this way, the Government can ensure that a portion of the money awarded on a contract goes to small businesses. Question 9 asks: "In addition to the contractual work you have with the DoD, do you perform a substantial amount of work as a subcontractor for another company performing on a Government contract?" Of the companies answering this survey question, 54% stated that they do a substantial amount of work as a subcontractor for another company performing on a Government contract. Forty-six percent of the companies that answered this survey question stated that they do not do a substantial amount of work as a subcontractor for another company performing on a Government contract.

The assumption was that many Environmental Remediation businesses subcontract with larger companies and that these responses would have a higher percentage in the category of "Greater than 50%" of the company's business with the U.S. Government. But Figure 5-1 reveals that only 32% of the companies do more than 50% of their business with the U.S. Government while over 60% of the companies surveyed did less

than 50% of their business with the U.S. Government. The survey results show that businesses do not rely on the U.S. Government for the majority of their business.

4. Environmental Remediation Business Weaknesses

The purpose of question 17 was to determine the principal weaknesses that each company had in contracting with the Federal Government regarding specifically the Environmental Remediation Industry. Of the 76 small businesses replying to this survey, 43 provided answers to this question. The primary weaknesses of each small business were that they felt that they were too small and had too little capital to compete with their larger competitors. Many of the companies stated that because they were small, they did not have the experience necessary to conduct all types of remediation work. But they did feel that they learned and gained experience with each job completed. They felt that they did not have time for all the red tape and the overburdening paperwork involved in conducting businesses with the Government. Many did not have an approved accounting system. Finally, a few companies felt that they did not have any principal weaknesses.

Large businesses answered this question very similarly to the small businesses. Of the 18 large businesses replying to this survey, 12 provided answers to this question. The primary

weaknesses of each large business in the survey were that they felt they were not large enough to do some of the environmental remediation required by the Department of Defense. They were also reluctant to submit a proposal on contracts with no guaranteed meaningful work. Like small businesses, they have had little knowledge of Federal regulations and procedures. Many companies had regional roots and had not expanded their operation. They had very little DoD experience, a limited professional staff, and many did not have an approved accounting system. Many large businesses felt that they were at a disadvantage by not being able to compete for Environmental Remediation contracts under the small business, 8a set-aside program, where the priority is to a small business.

The next section will analyze four areas where the size of the Environmental Remediation Company made a difference in the answers on the surveys.

E. ANALYSIS OF SURVEY QUESTIONS WHERE SIZE MATTERS

Of the businesses that answered the survey questions, there were a few questions whereby the small and large businesses answered the survey quite differently. The differences that will be analyzed in this section include the areas where size did make a difference in their answers. The areas that will be

discussed are: 1. Cost Control Measures, 2. Capabilities, 3. Strategies, and 4. Key Problems.

1. Cost Control Measures

This question was asked to determine what types of cost control measures large and small Environmental Remediation Companies use to remain competitive and successful in the industry.

a. Small Business Cost Control Measures

Table 5-2 lists a few of the most common types of controls used by small business Environmental Remediation Companies to keep their costs competitive within the Environmental Remediation. The control measures listed in Table 5-2 are ranked in the order of precedence, from highest to lowest, given by the surveyed Environmental Remediation

TABLE 5-2

SMALL BUSINESS COMMON COST CONTROL MEASURES

CONTROL MEASURE
Low Overhead
Close Supervision from Managers and Program Managers
Cost Controls on Materials
Partnering
Small Administration Staff
Cost Comparisons on Labor, Salary Comparisons
Stay Small and Efficient
Hire Retirees for Specific jobs and Lay Off Between jobs
Source: Developed by Researcher

Companies. The majority of the environmental remediation small businesses maintain a low overhead to remain competitive in their market.

b. Large Business Cost Control Measures

Of the 18 large businesses replying to this survey, 13 provided answers to the question of cost controls that they have within their companies to help keep costs competitive within their market. Table 5-3 lists a few of the most common cost controls utilized by the large businesses to keep their costs competitive within their market. Again, the control measures listed in Table 5-3 are ranked in the order of precedence, from highest to lowest, given by the surveyed Environmental Remediation Companies.

By looking at Tables 5-2 above and 5-3 below, it is easy to

TABLE 5-3 LARGE BUSINESS COMMON COST CONTROL MEASURES	
CONTROL MEASURES	
Closely Examined Budget	
Market Research	
Cost Control and Mgmt Systems Focused on Job Efficiency	
Market Driven Pricing Structure	
Reduced Overhead	
Detailed Review Process	
Competitive Bidding	
Long Term Employees; Turnover is Almost Non-existent (Mature Employees)	
Cost Accounting Standards (CAS) Compliant	
Maintain State of the Art Equipment and Methods	
Effective Personnel	
Certified Matrix Management	
Source: Developed by Researcher	

see the different cost controls methods used by both small and large businesses. The only common cost control measure that both large and small companies use, is that they both try to keep costs low by closely examining their budget.

2. Capabilities

a. Small Business Capabilities

The purpose of question 16 was to find out whether specific companies had any capabilities that distinguished them from all others in the Environmental Remediation Industry. Table 54 lists a few of the most common types of capabilities used by small Environmental Remediation Companies. Of the 76 small

TABLE 5-4
SMALL BUSINESS CAPABILITIES
Large Quality Assurance System in place
Specialize in a Specific Type of Remediation
High Quality (Experienced people)
Experience
Small, Ability to control costs
Treat all clients the same
We offer special training to our clients (OSHA Cert, etc.)
Responsive and flexible
No Distinguishing Capabilities
Source: Developed by Researcher

businesses replying to this survey, 53 provided answers to this question.

b. Large Business Capabilities

Table 5-5 lists a few of the most common types of capabilities used by large Environmental Remediation Companies. Of the 18 large businesses replying to this survey, 12 provided answers to this question. The main capability of the large companies is that they attempt to specialize in a specific area of remediation. Large companies acknowledge that past performance is critical to receiving future business. Therefore, large companies attempt to keep their performance in a positive light at all times.

At the same time, large companies try to provide a variety of services, to act as full service remediation companies. When they do not have a service required by a customer, they subcontract with small businesses that have that capability. They try to keep offices nationwide, have the capability of producing their own prototypes, along with specialized equipment used in the remediation industry. Large companies also try to have large staffs with experienced people with very knowledgeable team leaders. All of this combined creates a large Environmental Remediation Company with many capabilities that could classify them as a Full Service Environmental Remediation Company.

TABLE 5-5
LARGE BUSINESS CAPABILITIES

Specialized Services
Superior Past Performance
Variety of Services (Full Service)
Capability of Producing Own Prototypes and Specialized Equipment (State of the Art)
Many Patented Processes
Many Offices Nationwide
Large Staff with Experienced Folks and a Leader Who Has Networked with Teaming Partners
Construction In-House
Source: Developed by Researcher

3. Strategies

a. *Small Business Strategies*

The purpose of asking the Environmental Remediation Companies about their strategies was to determine the strategies used by these companies to be successful in the Environmental Remediation Industry. Table 5-6 lists a few of the most common strategies that each small business had. Of the 76 small businesses replying to this survey, 40 provided answers to this question.

Small businesses tended to use strategies to acquire as much business as possible. They used Internet Web sites; direct marketing; and remained active in associations, trade journals and conferences. Small businesses also recognize the value of their quality

TABLE 5-6
SMALL BUSINESS STRATEGIES

Use of a Web site-Obtaining Solicitations before They Are Out for Bid through the Internet.
Customer Oriented
Teaming
Stress Small Business Considerations
Encourage Long-term Relationships with Contractors
Direct Marketing
Specialty Services
Active in Associations, Trade Journals and Conferences
Quality Performance
Control of Costs
Source: Developed by Researcher

of performance and past performance to future business. They also attempt to be customer oriented and stress small business consideration. By combining all these strategies, small businesses have been successful in competing with large and small environmental remediation competitors.

b. Large Business Strategies

The same question was asked of the large Environmental Remediation Companies. Of the 18 large businesses replying to this survey, 13 provided answers to the question of which strategies were used by companies to be successful in the Environmental Remediation Industry. Table 5-7 lists a few of the most common strategies that each large business used to be

successful in their industry. Both large and small companies listed Teaming and Partnering as a business strategy.

Strategies used by the large Environmental Remediation Companies included quality in workmanship, partnering, and working intimately with their customers. Large businesses will

TABLE 5-7 LARGE BUSINESS STRATEGIES	
Focus on Quality	
Partnering	
Matrix Management	
Utilizing Sub-contractors	
Work Intimately with Customers	
Bidding only on Fixed-Price Contracts	
Shifting Out Into Commercial and Agricultural Sectors	
Source: Developed by Researcher	

subcontract and partner when either they cannot perform the work or they do not have time to perform the work. Many large companies are attempting to seek work by conducting environmental remediation in the commercial sector and in the agricultural sector on farms.

4. Key Problems

The purpose of asking each company what their key problems were in the performance of Government Remediation Contracts was to find solutions to these problems. Of the 76 small businesses

replying to this survey, 44 provided answers to the question of which problems each company had.

a. Small Business Problems

A few of the key problems listed by the small businesses were different than those of the large businesses. Table 5-8 lists a few of the most common problems that each small business had in the performance of Government environmental remediation contracts.

TABLE 5-8 SMALL BUSINESS PROBLEMS
Lack of Technical Capability within the Government Contracting Office
Payment Delays
Have Not Contracted with the Government
Too Much Red Tape
Changing Requirements
Required Bonding for Service Type Contracts
Different Interpretation of Contract Requirements
Out of Date Specifications (Tied to Outdated and Old Regulations)
Source: Developed by Researcher

b. Large Business Problems

Table 5-9 lists a few of the most common problems that each large business had in the performance of Government environmental remediation contracts. Of the 18 small businesses replying to this survey, 12 provided answers to this question.

There are a few similarities between the large and small companies that are similar to many companies in many different

TABLE 5-9 LARGE BUSINESS PROBLEMS	
Too Much Paperwork	
Payment Delays	
Government Inability to Move at the Rate of Business	
Excessive and Antiquated Regulations and Terms and Conditions	
Long Delays between End of Project and Start of Next Project	
Government Bureaucracy	
Inability To Be Flexible	
Unwritten Change Orders	
Source: Developed by Researcher	

specialties. Both large and small Environmental Remediation Companies list payment delays and massive paperwork as a problem with the performance of Government environmental remediation contracts.

F. SUMMARY

To summarize Chapter V and to give a clearer picture of the Environmental Remediation Industry, the average Environmental Remediation Company is made up of companies with the Standard Industrial Classification (SIC) Code of 8744, Engineering, Accounting, Research, Management and Related Services, facilities Support Management Services. Their businesses provide primarily services and are privately owned. The average

company has been in business for less than 10 years, with approximately 1-19 employees. The average company has an annual sales volume of between \$1 million and \$5 million and has a total value of all active contracts with the U.S. Department of Defense of either under \$500 or more than \$5 million. Only 4% of the companies do business with foreign governments and approximately half of the companies do subcontracting work. Ninety-seven percent of the industry classifies their company industry position as full competition. Of the companies surveyed, 79% of the companies are small businesses, with the majority of them being classified as an 8a firm.

The average Environmental Remediation Company has conducted contracts with the Department of Defense an average of 5 years. The companies have conducted remediation work primarily on soil, but also on water, air and other materials. The majority of contracts conducted with the Department of Defense were Firm Fixed-Price, with cost-reimbursement coming in a close second. The majority of the Environmental Remediation Companies had controls in place to keep their costs competitive within their market. Small and large companies had their own type of controls. The small Environmental Remediation Companies used low overhead, small administrative staffs, close supervision from managers, partnering, cost controls on labor and materials, and attempts to stay small and efficient. The cost controls

used by the large Environmental Remediation Companies were to use market research on materials, cost controls focused on job efficiency, reduced overhead, competitive bidding, and maintaining state of the art equipment and methods.

Each company also had capabilities that distinguished them from their competitors. The capabilities used by the small Environmental Remediation Companies were a large quality assurance system, specializing in a specific type of remediation, high quality personnel, and experience. The capabilities used by the large Environmental Remediation Companies were also a specialized service, superior past performance, many patented processes, and a large staff.

The large Environmental Remediation Companies also used a variety of environmental services that allowed them to consider themselves a full service remediation company. Perceived weaknesses for small companies included feeling too small and not having enough capital to compete for Government contracts. They did not know the process of how to compete with for Federal Government contracts and it's overburdening paperwork. The weaknesses of the large Environmental Remediation Companies were that they felt they were not large enough to do all the jobs they wanted to do. They also felt they did not know all the Federal regulations and procedures and did not have DoD experience.

Strategies used by the companies were to be customer oriented, use a Web site for obtaining solicitations, teaming, long-term relationships with contractors, focus on quality, and remaining active in associations, trade journals, and conferences. Problems encountered by both large and small companies were payment delays and too much red tape conducting business with the Government. Another problem stated by many of those surveyed was the Government's inability to move at the rate of business. Within the industry, there appeared to be confusion over whether the industry was getting larger or smaller. The same number of companies felt that the Environmental Remediation Industry was getting larger as felt it was getting smaller. The main reasons the companies gave for the industry getting larger were more public awareness, DoD downsizing and the Military Base Realignment and Closure (BRAC) process, and more stringent safety standards. Some companies felt that the industry was getting smaller because the Federal environmental budget was getting smaller, contracts were being consolidated, and regulation agencies had relaxed their standards.

The goal of Chapter V was to give an in-depth analysis of the Environmental Remediation Industry. Chapter VI provides the principal conclusions and recommendations for this study. It also provides areas for future research.

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VI. CONCLUSIONS AND RECOMMENDATIONS

A. INTRODUCTION

This chapter presents the conclusions of this thesis and offers recommendations and suggestions for further research. These conclusions and recommendations are intended to promote further thought or discussion on the increasingly important matter of environmental contracting.

The objectives of this thesis were to determine the nature of the Environmental Remediation Industry and to show how a comprehensive analysis of the industry can contribute to a better contractual relationship between the Federal Government and Environmental Remediation Companies. The principal conclusions were derived through the analysis of data from a survey that was distributed to over 400 Environmental Remediation Companies across the United States. The survey results produced several significant findings. Subsequent conclusions allowed for recommendations and suggestions for further investigation.

B. CONCLUSIONS

1. Environmental Remediation Companies are not Dependent on the DoD Business for Survival. Most companies replied to the

question about what percentage of their business is with the U.S. Government with "less than 5%." Over 63% of the companies surveyed did less than 50% of their business with the United States Government. Most of the companies, 32% of those that answered, had active contracts of under \$500. Environmental Remediation Companies do not, for the most part, provide services to foreign governments. Only 4% of the companies surveyed had provided contracts with foreign governments.

Both of these indicators support the fact that the Environmental Remediation Industry does not depend on the Department of Defense business for survival.

2. Small Businesses Dominate the Environmental Remediation Industry. Survey statistics show that 79% of respondents identified themselves as a small business. Small businesses thrive in the Environmental Remediation Industry by partnering and subcontracting with the larger companies. Larger companies subcontract to smaller companies when the work is either not their specialty or they are too busy to perform the work themselves.

3. A Majority of the Environmental Remediation Companies provide services versus goods. Eighty-nine percent of the respondents indicated that they have a contract with the DoD to provide services versus having a contract to manufacture goods. A small number of respondents (11%) replied that they provide goods.

Over 79% of the respondents were small businesses. Of these companies, more than 44% had less than 20 employees. These percentages are an approximation of the Environmental Remediation Industry as a whole. The primary Standard Industrial Classification (SIC) Code for the services that 32% provided was 8744, Engineering, Accounting, Research, Management and Related Services, Facilities Support Management Services, of division I. Ninety-seven percent classify their industry as Full Competition.

)

4. Environmental Remediation Companies are located in states with Strict Environmental Laws. The devolution of environmental regulation will continue and may well accelerate in the coming years. Political pressures favoring decentralized enforcement are too broadly based to reverse this course in the near future. The majority of Environmental Remediation Companies are located in states with strict environmental laws. Five of the states that have the strictest environmental laws are California, Texas, Florida, Colorado, and Georgia. Each of these states is home to more than 20 Environmental Remediation Companies. These results show that the Environmental Remediation Companies do not have their main offices in states where the environmental hazards are located, but in states with the strictest environmental laws. Democratic governors in states where the Democrats also control the legislature are associated with more

strident environmental policies and enforcement, while Republican control generally indicates less strident environmental action (Smith, 1997, p.22).

5. Environmental Remediation Companies feel overburdened by all the U.S. Government contract paperwork. Many companies, both large and small, complained about the overburdening paperwork involved with doing business with the U.S. Government. They also were unhappy about red tape when competing in the Government system. The Federal Government has an initiative in process whereby they are working toward paperless contracting. The approval of this process has made slow progress through the legal channels for many reasons. One of the reasons that legal departments have raised concerns, involves the legality of contract signatures. Presently, parties sign on paper-hard copy. With paperless contracts, they would provide electronic signatures via the Internet. Some lawyers question whether electronic signatures would be binding and hold up in court.

C. RECOMMENDATIONS

1. The military must be proactive in support of the environmental laws. The military must maintain compliance with Federal environmental laws while maintaining their strategic mission. For the military to be successful, it must take a proactive role in environmental issues and laws. Military environmental managers need to devise a compliance strategy that

adapts to local demands while at the same time ensures continuing mission accomplishment. Though this is not the primary role of the U.S. Military, they will find themselves being reactive rather than proactive if they are not forward looking. For the military to be successful, they must conduct compliance within their military mission requirements.

2. Do no reduce or eliminate small business representative offices. With the Department of Defense's drawdown, the Federal Government has also reduced their infrastructure. Each Government agency must look at their organization to find opportunities for force reduction. The researcher recommends that a serious look be given to the office of Small and Disadvantaged Business Utilization (SABDU) and the small business liaison offices. Of the offices that are critical to the small environmental remediation businesses, these offices are ones that should not be reduced.

Small businesses are an important element of the Environmental Remediation Industry—over 70% of the companies in this survey are small businesses—maintaining a close relationship between small Environmental Remediation Businesses, the U.S. Government, and the Department of Defense is critical.

SABDU and the small business liaison offices do more than merely represent the Government; they oftentimes help small businesses with the paperwork necessary to complete a contract.

Personnel responsible for these offices need to make sure that these offices remain fully manned.

3. Reduce the overburdening contract paperwork in dealing with the U.S. Government and DoD. Both large and small Environmental Remediation Companies have complained about the overburdening paperwork involved with doing business with the U.S. Government and the Department of Defense. They also complained about the difficulty in navigating through red tape as they compete within the Government system. The Federal Government has initiated a process that will result in paperless contracting.

A renewed emphasis should be placed on getting paperless contracting approved and enforced through the Department of Defense and other Federal agencies. By evolving to paperless contracting, the Government would open the door to many contractors who do not compete at this time. This would increase competition and possibly result in a cheaper proposal.

4. The Environmental Remediation Industry Needs to be educated. Many contractors in this survey complained that the red tape and overburdening paperwork were preventing them from competing for government contracts. Independent offices can be set up within the different Department of Defense, Federal, and state organizations to assist small and large Environmental Remediation businesses in completing the required paperwork. Currently there is an organization called the Procurement

Technical Assistance Center (PTAC) which is an organization dedicated to helping small companies do business with the Federal Government. They also serve as sponsors for companies planning on becoming DoD contractors and assist them in receiving their CAGE code. The problem is that the majority of small businesses surveyed were not familiar with this organization. The Procurement Technical Assistance Center needs to be more proactive in making small businesses aware of their mission. They could also act as mentors to the businesses. By setting up an office within the organizations, along with the recommendation to enforce paperless contracting, the Government will increase competition, which, in turn, tends to drive down the overall contract price.

D. ANSWERS TO THE RESEARCH QUESTIONS

The following are the answers to the primary and subsidiary research questions. The answers to these questions were derived from the findings and conclusions.

Primary Research Question: What is the nature of the industry involved in Environmental Remediation Industry and how might a comprehensive analysis of the industry contribute to more improved contracts between the Federal Government and the environmental companies? The nature of the Environmental Remediation Industry suggests that the industry is made up

primarily of both large and small businesses that thrive on partnering and subcontracting. The majority of companies do not conduct business with foreign governments. The market is considered Full Competition, and 70% of the companies surveyed classified themselves as an 8a firm. Most companies have conducted remediation contracts with the Department of Defense for approximately five years, primarily on soil, but also on water, air, and other materials. The primary contract type has been Firm Fixed-Price (FFP), which places the majority of the risk on the contractor. They have also conducted cost-reimbursement contracts, which place the majority of risk on the Government. Small businesses are not required to meet the Government Cost Accounting Standards (CAS), but this analysis determined the many companies, regardless of size, do not meet CAS. Neither small nor large companies depend on the U.S. Government for the majority of their business.

The analysis of the Environmental Remediation Industry suggests that the Government needs to make innovative improvements to their contracting vehicles. They need to enforce paperless contracting to relieve the burden on both large and small contractors. Additionally, the Government needs to remove or alleviate some of the risks to the contractor that are embedded in Firm Fixed-Price (FFP) contracts. More emphasis should be placed on cost-reimbursement type contracts for

environmental remediation. While contractors partner with each other to compete, the Government needs to partner with contractors to resolve contractual problems and to assist large and small businesses in becoming more efficient.

Subsidiary Question 1: What is a working definition of the Environmental Remediation Industry? A working definition of the Environmental Remediation Industry is as follows: the industry consists of companies that engage in the process of reducing contaminant doses that might otherwise be received in abnormal exposure conditions and that also clean up toxic waste sites. The remedial techniques are divided into two basic types: on-site methods and removal methods. Most remedial techniques are used in combination (e.g., pump and treatment systems) rather than only one system. Remediation Companies are generally classified with the Standard Industrial Classification (SIC) Code of 8744, which is "Engineering, Accounting, Research, Management and Related Services, Facilities Support Management Services (Cunningham, 1998, p. 27).

Subsidiary Question 2: What have been the patterns or trends with regard to the nature of the environmental industry during the past ten years? Several trends were noted in this analysis. The Environmental Remediation Companies felt that the industry was receiving more exposure awareness and public interest. They also have had to conform to more stringent

environmental safety standards and a proliferation of Environmental Protection Agency (EPA) Regulations. Many companies felt that the industry was expanding because of increasing public awareness due to environmental accidents, BRAC, and the fact that more DoD contracts are moving from the architecture and engineering stage into the remediation stage.

Subsidiary Question 3: What are the strategies firms in this industry use in the pursuit of Government environmental remediation contracts? Several strategies were noted in the analysis of the Environmental Remediation Industry. Small businesses used Web sites for obtaining solicitations before they were actually out for bids, focused their business on being customer oriented, stressed small business considerations, and made use of teaming. They encouraged long-term relationships with contractors, conducted direct marketing, and remained active in professional associations, trade journals, and conferences. Large businesses focused on quality, utilized a matrix management system, and worked intimately with their customers. They also hired subcontractors and shifted their focus from military to commercial and agricultural areas of remediation. Both large and small companies focused on quality.

Subsidiary Question 4: How might the knowledge acquired through research of the Environmental Remediation Industry be most effectively utilized in structuring contractual

arrangements? Throughout the survey, there were trends from both large and small Environmental Remediation Companies, which if acted upon, could increase competition within the industry and ultimately lower the price of the Environmental Remediation contracts. One major area would be to use a contracting vehicle that removes much of the risk from the contractor and places it back on the Government's shoulders. The Government should stop using Firm Fixed-Price (FFP) contracts except where there is a small, well-defined area that needs to be cleaned up.

When large, well-defined areas need to be cleaned up, a cost-reimbursement type contract should be used. This will reduce the risk on the contractor, increase competition, and lead to better, cheaper remediation contracts. By using a Firm Fixed-Price type contract, the contractor generally finds differing site conditions requiring change orders and modifications to the contract, increasing the cost of the contract. By using a cost-reimbursement type contract, the Government and the contractor agree on a price for unforeseen conditions at the beginning of the contract, and there aren't as many surprises during the performance of the contract.

Another technique would involve Partnering with the contractor. The Government could enter into the initial stages of contract acquisition alongside a contractor and partner with them throughout the life of the contract. By partnering, the

Government reduces the risk of a contractor going out of business in the middle of a contract. Though this technique will increase the effort and manpower necessary to supervise a contract, in the end both the Government and the contractor will benefit. The Government will receive a better product and the contractor will feel that he is partners with the Government, not just the object of a large bureaucracy overseeing their project. Another area for the Government to focus on is accelerating paperless contracting.

E. AREAS OF FURTHER RESEARCH

The Environmental Remediation Industry continues to grow. Many people feel a need to further reduce the military. This means another round of BRAC. If this becomes necessary, more Environmental Remediation Companies will have to be hired. Environmental Remediation is a slow process—Fort Ord California has been in the clean up stages for more than 10 years now. It will become critical to follow changes in the Environmental Remediation Industry to keep in touch with the industry. Four recommendations for future research are listed below.

1. Conduct a future study on the Environmental Industry.

By replicating this thesis using the same survey in five years, the Department of Defense will have a better feel for this

changing industry. A second study would provide an opportunity to further analyze the Environmental Remediation Industry and also determine how the Department of Defense changes its philosophy toward Environmental Remediation Contracts.

2. Conduct a comparative analysis of the Environmental Protection Agency, the Energy Department, the Naval Facilities Engineering Command, and the Army Corps of Engineers. Conduct an analysis to determine the most effective methods of contracting for large and technically challenging Hazardous, Toxic, and Radioactive Waste (HTRW) remediation projects, which are ideally suited for cost-reimbursable contracts.

3. Conduct a study to determine if the U.S. Army's Total Environmental Restoration Contract (TERC) should be used across the Department of Defense (DOD) for environmental cleanup. In the next few years, every Department of Defense (DoD) agency will have to streamline their organizations by closing down some of their facilities. Maybe there is a standard Environmental Remediation contracting vehicle that the Department of Defense should use across the services.

4. Explore a few different areas if conducting this same research. Virtually all hazardous wastes remediation contracts

are either a Cost-reimbursement or Firm Fixed-Price contract. Do these contracts present the most efficient and effective vehicle to inspire contractors to perform their best during remediation or restoration?

APPENDIX A
SURVEY QUESTIONNAIRE

1 October 1998
Captain Ronald E. Hill
Naval Postgraduate School
SMC # 2794
Monterey, CA 93943-2794
(408) 392-0704
E-mail:rehill@nps.navy.mil

Attention: Director of Contracts

Dear Sir or Madam:

This cover letter is an introduction and a request for assistance in a Thesis research project on the Environmental Remediation Industrial Base. This e-mail is intended for the person at your activity responsible for contracts. This person may be yourself, or a person in sales, contracting, acquisition, purchasing, or in the case of small business, the president. If you are not sure who should be answering this survey, please do not hesitate to reach me at the E-mail address listed above for assistance.

My name is Captain Ronald E. Hill. I am an active duty Army Officer working on a Master's of Science in Management with an emphasis on Contract Management at the Naval Postgraduate School in Monterey, California. Upon graduation I will report to the Corps of Engineers and work with Environmental Remediation Contracts.

The focus of my research to explore the demographics of companies in the Environmental Remediation Industry, which might or might not have current contracts with the Department of Defense or the Government. My goal is to determine if a more thorough understanding of the Environmental Remediation Industry contracts with will help the DOD to foster a better working relationship with its industry.

You have been selected because you have a contractual relationship with the Department of Defense, the Small Business Administration, or you are listed as an Environmental Remediation Company. The responses you

provide to this questionnaire are very important and may help both you and the Government on future Environmental Contracts. For this reason, I ask that you take a few moments to accurately answer the questions on the following page. I know your time is valuable so I have limited the amount of questions and attempted to write them in a style which will reduce the amount of time required to respond. Please return the completed survey to my E-mail address, rehill@nps.navy.mil, or to my FAX at (408) 656-2138, or send to the above address.

Your response is anonymous. Thank you in advance for your assistance.

Ronald E. Hill
CPT, OD, USA

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PART I SURVEY DEMOGRAPHICS

1. a. What is the primary product or service of your company?

b. Are your Government contracts for goods 10 (11%) or services 84 (87%)? No Answer 2 (2%) (check either or both)

c. What is your primary Standard Industrial Classification (SIC) Code? 16 SIC Codes

d. Are you a publicly or privately held company? (underline one) Publically 4 (4%), Privately 69 (72%), No Answer 23 (24%).

2. How many years has your company been in existence? (check one)

a. 0-5 yrs 21(22%) b. 6-10 yrs 29(30%) c. 11-20 yrs 18(19%)
d. 21+ yrs 17(18%)

3. Please indicate the number of employees at your organization: (check one)

a. 0-19 <u>42(44%)</u>	d. 100-249 <u>11(12%)</u>	g. 1000-4999 <u>5(5%)</u>
b. 20-49 <u>8(8%)</u>	e. 250-499 <u>7 (7%)</u>	h. 5000-9999 <u>0(0%)</u>
c. 50-99 <u>16(16%)</u>	f. 500-999 <u>3 (3%)</u>	i. 10,000 or greater <u>1(1%)</u>

4. Where are the employees primarily located?

a. Corporate Headquarters. _____ (city)

b. At what locations are your employees principally located.
_____, _____.

5. What is the approximate current annual sales volume of your company? (check one)

a. Under \$ 100,000 <u>9(9%)</u>	d. \$1,000,000-\$4,999,999 <u>19(19%)</u>
b. \$100,000-\$499,999 <u>17(18%)</u>	e. \$5,000,000-\$9,999,999 <u>6(6%)</u>
c. \$500,000-\$999,999 <u>16(17%)</u>	f. \$10,000,000-\$49,999,999 <u>17(18%)</u>
g. \$50,000,000-100,000,000 <u>3(3%)</u>	h. > than \$100,million <u>5(6%)</u>

No Answer 4(4%)

6. What is the approximate total value of all active contracts you have with the DoD? (check one)

- a. Under \$ 500 30(32%)
- b. \$ 500-\$ 2,500 3(3%)
- c. \$2,501-\$9,999 5(5%)
- d. \$10,000-\$ 25,000 5(5%)
- e. \$ 25,001-\$ 99,999 6(6%)
- f. \$100,000-\$499,000 4(4%)
- g. \$500,000-\$ 999,999 9(9%)
- h. \$1,000,000-\$ 4,999,999 10(11%)
- i. Greater than \$ 5,000,000 20(21%) No Answer 4(4%)

7. What percentage of your business is with the U.S. Government? (check one)

- a. less than 5% 32(34%) B. 5-25% 17(18%) C. 26-50% 11(11%) D. 51-75% 20(21%)

e. Our company does nearly all or all its business with the government. 11(11%) No Answer 5(5%)

8. Is foreign sales a significant portion of your sales volume (> 25%) Yes 4(4%) No 90(94%) No Answer 2(2%).

9. In addition to the contractual work you have with DOD, do you perform a substantial amount of work as a subcontractor for another company performing on a Government contract? Yes 45(47%) No 39(41%) No Answer 12(12%).

10. Would you classify your company's industry position as: (CHECK ONE)

a. a Monopoly 1 (1%) (you are the only regional or national source for your product or service)

b. an Oligopoly 2 (2%) (there are only one or two other manufacturers in your industry)

c. Full Competition 93(97%) (there are many companies that produce your product or service)

11. a. Does the U.S. Government recognize your company as a small business? Yes 76(79%) No 18(19%) No Answer 2(2%).

b. If yes, does the U.S. Government recognize your company as an:

8A firm 23(30%), Women Owned 15(20%), Veteran 3(4%),
Small Disadvantaged Business 25(33%) Other 10(13%).

PART II ENVIRONMENTAL RELATED SPECIFIC QUESTIONS

12. How many years have you had DoD contracts for remediation effort?

- a. 0-1 yrs 33(34%)
- b. 2-5 yrs 22(23%)
- c. 6-10 yrs 8(9%)
- d. 10+ yrs 15(15%) No Answer 18(19%)

13. What type of remediation work have you completed with the DoD?

- a. Soil 43(32%)
- b. Water 23(17%)
- c. Air 11(8%)
- d. Other Materials 25(19%)
- e. Other 24(18%) No Answer 8(6%)

14. What type of contracts have you had and how many with the DoD? (Please indicate next to the appropriate contracts how many you have had)

- a. Fixed-Price 463(56%)
- b. Cost-Reimbursable 207(25%)
- c. Time and Materials 145(17%)
- d. Other 9(1%) No Answer 8(1%)

15. What controls do you have within your company that helps you keep your costs competitive within your market?

16. Does your company have any capabilities which distinguish you from all others in the Remediation industry?

17. What are your company's principal weaknesses in contracting with the Federal Government regarding Environmental Remediation?

18. What are some of the strategies used by your company?

19. What are the key problems you've had in the performance of Government Remediation Contracts?

20. Compared to ten years ago, has the volume of business in the Environmental Remediation Industry

- a. Increased 35(36%)
- b. Decreased 36(37%)
- c. Stayed the same 8(8%) No Answer 17(19%)

Why?

21. What caused the Environmental Remediation Industry to initially grow?

This completes the questionnaire. I would like to leave a few lines (optional) for you to use if you would like to bring any matter to my attention concerning the relationship between your company and the United States Government. Of particular interest would be recommendations for future studies that would improve the Environmental Remediation Industry.

Note: All data obtained from this questionnaire are confidential. It will not be used by any party other than the Thesis author. You have the option to remain anonymous, however if you have no objections, please provide the following in case I would need clarification regarding any of your answers:

Company Name _____

Address _____

Your Name (P.O.C.) _____

E-mail address _____

Phone Number _____

Fax Number _____

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APPENDIX B

CURRENT FEDERAL LAWS AND REGULATIONS

Currently there are many laws, rules, and regulations for the programs of the Environmental Protection Agency (EPA). Over the past 10 years there has been many key Environmental Laws passed into law.

FIGURE B-1

<u>YEAR</u>	<u>ENVIRONMENTAL LAWS, REGULATIONS AND ACTS</u>
1963	Clean Air Act (CAA)
1964	Wilderness Act
1965	Highway Beautification Act
1965	Water Quality Act
1967	Air Quality Act
1968	Wild and Scenic Rivers Act
1969	National Environmental Policy Act (NEPA)
1969	Endangered Species Conservation Act
1970	Clean Air Amendments
1970	Water Quality Improvement Act
1972	Federal Water Pollution Control Act
1972	Marine Mammal Protection Act
1972	Marine Protection, Research, and Sanctuaries Act
1972	Coastal Zone Management Act
1972	Federal Environmental Pesticide Control Act
1972	Noise Control Act
1973	Endangered Species Act
1974	Safe Drinking Water Act (SDWA)
1976	Federal Land Policy and Management Act
1976	National Forest Management Act
1976	Resource Conservation and Recovery Act (RCRA)
1976	Toxic Substance Control Act (TSCA)
1977	Clean Air Act Amendments
1977	Clean Water Act (CWA)
1977	Surface Mining Control and Reclamation Act
1978	Outer Continental Shelf Lands Act Amendments
1980	Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)

<u>YEAR</u>	<u>ENVIRONMENTAL LAWS, REGULATIONS AND ACTS (cont.)</u>
1980	Alaska National Interest Lands Conservation Act
1984	Hazardous and Solid Waste Amendments (HSWA)
1986	Superfund Amendments and Reauthorization Act
1987	Water Quality Act
1988	Endangered Species Act Reauthorization
1988	Federal Insecticide, Fungicide, and Rodenticide Act Amendments
1990	The Pollution Prevention Act (PPA)
1992	The Federal Facilities Compliance Act (FFCA)
1992	The Community Environmental Response Facilitation Act (CERFA)

Source: Developed by Researcher

The following are definitions of the most critical Laws, Acts, and Regulations listed above.

1. The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA): This statute, better known as the Superfund Act, establishes a fee-maintained fund to clean up abandoned Hazardous, Toxic, and Radioactive Waste (HTRW) sites which are closed or abandoned. A key aspect of this act is that section 120 requires compliance with all state and local environmental laws that apply to sites requiring remedial actions, other than those sites already on the National Priorities List (NPL).

2. The National Environmental Policy Act of 1969 (NEPA): The National Environmental Policy Act was actually enacted on January 1, 1970, and mandated a National Policy to encourage a productive balance between people and the environment. This policy was directed toward the operations of all agencies within the Federal Government. The Act required that an Environmental Impact Statement (EIS) be developed by the agency desiring to either construct facilities or conduct changes to basic operations. The process was to be performed as a study of impacts to the environment, assist in the information flow process, and aid in the Federal Government decision making process. It directed that all policies, regulations, and public laws must be in accordance with NEPA, considering the environmental implications of Government operation. However, NEPA lacked regulatory authority, because each agency only had to consider the environmental consequences of the change. The final operational decision remained with the initiating Government Agency. This law has particular application to the base realignment and closure (BRAC) process associated with many military installations ultimate reuse. This Act requires the preparation and performance of environmental assessments and an environmental impact statement, which considers current and future environmental implications of any given reuse plan, prior to execution of that plan (Manaster, 19 May 1994, p. 16).

3. The Pollution Prevention Act (PPA): The Pollution Prevention Act (PPA) of 1990 stated that the policy of the United States covering pollution should focus on the prevention of emissions into the environment from the source of all pollutants. The Act stated that:

pollution should be prevented or reduced at the source whenever feasible; pollution that cannot be prevented should be recycled in an environmentally safe manner, whenever feasible; pollution that cannot be prevented or recycled should be treated in an environmentally safe manner whenever feasible; and disposal or other release into the environment should be employed only as a last resort and should be conducted in an environmentally safe manner (Lee, 14 January 1993, p. 3)

This was a new direction in the environmental policy of the United States, which involved the reduction of both point source and nonpoint source pollution. To achieve this new direction, the EPA established the Office of Pollution Prevention for the promotion of a source reduction campaign and subject related awards programs (Manaster, 19 May, 1988, p. 18).

4. The Clean Air Act (CCA): Originated in the 1950s and helped to change the course of future environmental regulations. Prior to the 1950s, State and local governments individually controlled air quality and atmospheric emissions. The Act has been amended six times, the last coming in 1990. The 1990 changes had the greatest impact on the national industrial base and significantly strengthened the environmental protection roles of the Federal Government. The EPA was designated to establish air quality standards. The National Ambient Air Quality Standards (NAAQS) are expressed as concentrations of designated pollutants. It requires the Environmental Protection Agency to set mobile source limits, ambient air quality standards, hazardous air pollutant emission standards, standards of new pollution sources, and significant deterioration requirements, and to focus on areas which do not attain standards (Schumacher, 1988, p. 50).

The Act also assigned the EPA responsibility for implementing the emission standards program and establishing a timetable for national compliance. This included both stationary and mobile sources of air pollution. In addition, the EPA was directed to establish additional national standards and programs for the following: new pollution sources, hazardous pollutants, mobile sources (including those covering motor vehicle fuels), the prevention of significant air quality

deterioration in clean areas, and strict controls for areas that have not attained the national standards. To achieve these standards, Congress granted the EPA additional authority to assess administrative fines and penalties (Schumacher, 1988, p. 62).

5. The Clean Water Act (CWA): During the 1950s and 1960s, States individually set ambient water quality standards and developed the plans to implement those standards. In 1972 and 1977, Congress amended the Federal Water Pollution Control Act (FWPCA), first by combining water quality standards and effluent limitations and second, by expanding it to include toxic and hazardous water pollution. After these amendments, the Act has been commonly called the Clean Water Act (CWA) (Manaster, 19 May 1994, p. 22). The current CWA is a system that authorizes States to establish programs to implement the national ambient water quality standards. In addition, it is now illegal for any person or organization to discharge pollutants from a point source into any waters of the United States. The process included the establishment of a permit system controlled by either the EPA or the State (the permitting authority). The permits are obtained under the National Pollution Discharge Elimination Standards Program (NPDES) and only allow specific limited amounts of emissions (Schumacher, 1988, p. 62).

The authorizations included the use of best management practices in controlling the emission of hazardous material into the United States waters. However, the practices are descriptive in nature and do not list any quantifiable reduction amounts. The CWA also includes a reporting system for dischargers to report normal, noncompliance and emergency amounts of hazardous waste discharged (Schumacher, 1988, p. 64). The CWA affected the operation of all defense contractors that emit toxic or hazardous material into United States waters. Through a permit and best practice system, all parties are required to meet or exceed the established national standards. As amended, the CWA includes the authority to impose fines and civil punishment for violations (Schumacher, 1988, p. 64). Focusing on the regulation of the intentional disposal of materials into ocean waters and authorizing related research is the Ocean Dumping Act.

6. The Community Environmental Response Facilitation Act of 1992 (CERFA): CERFA addresses both the rapid identification, remediation and restoration of contaminated areas, and the transfer of excess Government property. This Act is in response to the perceived economic hardships experienced by local communities after the closure of a facility and the delay in ultimate property transfer due to the process of environmental

remediation efforts. Under CERFA, DoD can release parcels of land that neither present environmental hazards nor are considered a threat to health and human safety. The transfer of parcels can occur while remediation efforts are being performed at other sites on the installation.

7. National Priorities List (NPL): Using the Hazard Ranking Systems (HRS), the Environmental Protection Agency evaluates contaminated sites for their potential to affect human health and the environment. The HRS is a numerical scoring system, which provides a means of applying uniform technical judgement regarding the potential hazards posed by a site relative to other sites. The HRS does not address the feasibility, desirability, timing, or degree of cleanup required. Sites that score 28.5 or greater are considered for placement on the NPL. For DoD, NPL status generally refers to the entire installation, not to any individual site on the installation (Annual Report to Congress, 1996, P. C-2)

8. The Safe Drinking Water Act (SDWA): The Safe Drinking Water Act (SDWA) was first signed into law in 1974 to ensure safe drinking water to all citizens. Like many other environmental matters, it was amended in 1976, 1977, 1979, 1986, and 1988. This resulted in the establishment of primary drinking water

regulations for 83 contaminants. Of particular concern to the general public was lead contamination, which is now banned in all public water systems (Schumacher, 1988, p. 69). The resulting directives required that all states develop programs to protect underground water wellhead areas. Federal facilities that are identified as actual or potential sources of contamination all must comply with all SDWA requirements. This extended into the enforcement area, making Federal facilities responsible for any penalties or fees charged by State government application programs (Schumacher, 1988, p. 71).

9. The Resource Conservation and Recovery Act of 1976 (RCRA): This act was signed in 1976 and subsequently amended in 1978, 1980, 1984, and 1986. The RCRA picks up where the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) left off and establishes cradle-to-grave management responsibilities for hazardous waste generators. The Act established a national strategy for hazardous waste management of current and future operations. The RCRA was designed to establish a Federal program to regulate hazardous waste management. The amendment resulted in a disposal prohibition of untreated hazardous waste at landfills. The Act also provided minimum standards on all facilities handling hazardous material and a permit system for all treatment, storage and disposal

facilities. Responsibilities include record keeping on generation, transportation, storage, and disposal of hazardous materials (Lee, 14 January 1993, p. 23).

10. The Energy Planning and Community Right-to-Know Act (EPCRA):

The Energy Planning and Community Right-to-Know Act was designed to support State and local emergency planning efforts and information concerning potential hazards in their communities. To enforce this law, the EPA created the annual Toxics Release Inventory (TRI) for release to the public. Manufacturers are required to report to the State and EPA the amounts of over 300 toxic chemicals that they release into the environment or transfer to waste treatment or disposal facilities. For purposes of emergency planning, a Governor or a State Emergency Response Commission can designate additional facilities, which are subject to the reporting requirements after public notice and the opportunity for comment. This Act was noted by a marked departure from the previous obligated to comply with the requirements because the word "person" was used and Federal facilities were not technically included in the definition of person. However, this Act did extend to current Government-Owned/Contractor-Operated (GOCO) facilities (Shulman, 1992, p. 196).

11. The Toxic Substances Control Act (TSCA): In 1976, Congress took action to regulate hazardous and toxic material, waste and the prevention of possible health and environmental risks. The Toxic Substances Control Act (TSCA) directed the EPA to require manufacturers and processors to conduct tests for existing chemicals if: (1) their manufacture, distribution, processing, use or disposal may present an unreasonable risk of injury produced in substantial quantities and the potential for environmental release or human exposure is substantial; (2) existing data are insufficient to predict the effects of human exposure is necessary to develop such data (Lee, 14 January 1993, p. 71).

The TSCA also included: (1) the control of unreasonable known health and environmental risks levels, (2) the prevention of future health and environmental risks, and (3) the establishment of an informational flow process covering all aspects of potential harm to public health and the environment. To achieve these goals, the EPA was given the authority to regulate private industry. The authority allowed the EPA to regulate production, processing, storage, distribution, use and disposal of chemicals that could cause potential harm to human health and the environment. To enforce the regulations, the EPA was given a range of authority. It included the total ban on production, the application of chemical warning labels and a

system of fines for violations (Shulman, 1992, pp. 193-194). This Act caused changes in all areas of operations for Federal Government agencies and defense contractors.

12. The Federal Facilities Compliance Act of 1992 (FFCA): Prior to this law, there was the feeling that DoD was hiding behind the interpretation of sovereign immunity to avoid fulfilling its hazardous waste cleanup and management responsibilities. The Federal Facilities Compliance Act (FFCA) was signed in 1992. The FFCA clarifies and reinforces what was already stated in CERCLA and its amendments, stating that Federal facilities are subject to the penalties, civil and administrative fines for violations of Federal, state, and local laws dealing with the handling of solid and hazardous wastes. The Act allows the EPA a new and powerful enforcement tool over the DoD; no longer could the DoD rely on sovereign immunity (Lombardo, Winter/Spring 1993, p. 28).

13. The Environmental Research and Development Demonstration Act (ERDDA): authorizes all Environmental Protection Agency research programs.

14. The National Environmental Policy Act of 1969 (NEPA): Requires, in part, the Environmental Protection Agency to review

environmental impact statements. The Act requires the preparation and performance of environmental assessments and an environmental impact statement, which considers current and future environmental implications of any given reuse plan, prior to execution of that plan.

15. The Hazardous and Solid Waste Amendments (HSWA) of 1984:

Commonly referred to as the amendments (passed in 1976) to the Resource Conservation and Recovery Act (RCRA).

The increased environment awareness and health risks from the exposure to hazardous material contributed to Presidential actions that strengthened the EPA's position. The President extended environmental laws and regulations to all Government agencies. A summary of pertinent executive orders follows. They are provided to show the complexities faced by civilian companies, DoD, and defense contractors.

16. Executive Order 11472: Issued in 1969, Executive Order 11472 established the Citizen's Advisory Committee on Environmental Quality and the Environmental Quality Control Council. President Nixon contributed to the future changes in the environmental policies of the United States. The Council and Committee actions led to the drafting of legislation that created NEPA (Kunkel, 1992, p. 11).

17. Executive Order 12088: In 1978, President Carter signed Executive Order 12088, which mandated that all Federal Agencies assume a leadership role in pollution prevention, control and compliance with all existing environmental laws, pollution control standards and regulations. The opening section stated that this applied to all Federal facilities and activities under the control of the agency. However, the definition of activities under the control of the Agency was not provided in the text of the Executive Order (Shulman, 1992, p. 199).

16. Executive Order 12580: In 1986, President Reagan signed Executive Order 12580, which limited the EPA's jurisdiction in enforcing environmental compliance and cleanup at Federal Government facilities. It addressed the delegation of duties and powers assigned to the President under CERCLA. The Order required a National Contingency Plan (NCP) to provide teams to respond during national or regional environmental emergencies.

More important to Federal facilities, it exploited an enforcement loophole in Executive Order 12088. The Department of Justice (DOJ) was given the authority to approve any EPA enforcement actions against other Federal Agencies. The DOJ

determined that one body of the executive branch could not sue another over environmental cleanup or compliance actions. The Order called for the Office of Management and Budget (OMB) to facilitate resolutions between agencies (Shulman, 1992, p. 55).

19. Executive Order 12856: In 1993, President Clinton signed an Executive Order directing all Federal Agencies to comply with the reporting requirements of the Emergency planning and Community Right-to-Know Act. This related to the use, processing, manufacture and release of hazardous and toxic chemicals. The order also directed the Federal Government to incorporate pollution prevention through source reduction in management and acquisition activities to reduce the total release and offsite transfer for treatment and disposal of toxic chemicals. It further required acquisition policies to be changed, to reduce or eliminate unnecessary hazardous substances and toxic materials. In addition, the Executive Order encourages Federal agencies to develop and test innovative pollution prevention technologies, including the formation of partnerships with industry and academia to solve pollution problems (The Government Contractor, 11 August 1993, p. 16-17).

20. Executive Order 12873: Also in 1993, President Clinton signed Executive Order 12873, entitled "Federal Acquisition,

Recycling and Waste Prevention." The order required the head of each Federal Government Agency to incorporate waste prevention and recycling into the agency's policies and daily operations. It also directed agencies to develop policies to use environmentally preferable products and services and to implement cost-effective procurement preference programs favoring the purchase of such products and services. The order also directed the procurement related requirements to be implemented in the Federal Acquisition Regulation within 180 days of signing (The Government Contractor, 27 October 1993, p. 12).

In 1986, California set the precedent for all other States to follow in terms of providing for safe drinking water and protection of the environment. The California Safe Drinking Water and Toxic Enforcement Act of 1986, or Proposition 65, is more stringent than the Federal SDWA or CWA. The law requires that the California's Health and Welfare Agency publish a list of chemicals that the State's scientific advisors have determined cause cancer and reproductive harm. The original list contained 136 chemicals and ranged from arsenic to vinyl chloride. The list also included a class of chemicals known as reproductive toxicants, such as ethyl alcohol (as in alcoholic beverages), lead, and the sterilizing agent ethylene oxide. The

reproductive toxicants, such as ethyl alcohol (as in alcoholic beverages), lead, and the sterilizing agent ethylene oxide. The subject chemicals are prohibited from emission into the State's water supply. The manufacturers of the designated chemicals must inform consumers, workers and the public of the health hazards from exposure to the chemicals (Sacarello, 1994, pp. 61-62).

The following is a list of California State Laws:

21. The Hazardous Waste Control Act (HCWA): Of the California Health and Safety Code, provides the California EPA and the California Department of Toxic Substance Control, the authority to administer the state's hazardous waste program. The HCWA implements relevant Federal regulations such as RCRA.

22. AB 2948-Hazardous Waste: Management Plans and Facility Siting Law: Addresses the involvement of counties in the management and oversight process of sites within their boundaries that have or generate hazardous wastes.

23. Title 22, Division 4, Chapter 30 of the California Code of Regulations (CCR): Includes the implementing language and regulations that pertain to the management of hazardous substances.

24. Title 23, Chapter 3 and 16 of the CCR: Articulates the regulations regarding the construction and monitoring of new and used underground storage tanks.

LIST OF REFERENCES

Alston, C. (1990). Key Players: Their Spheres of Influence Go from Heavens to Earth. *Environment 90: The Legislative Agenda* (Washington DC: CQ Press, 1990), 14-17.

Office of the Undersecretary Department of Defense. (1996). "Defense Environmental Restoration Program." Annual Report to Congress, vol. 2, p. C-2. Washington, DC: U.S. Government Printing Office.

Brace, P. & Jewett, A. (1995, September). The State of State Politics Research. Political Research Quarterly, 48, 643-659.

Brace, P. (1996, March). Federal Devolution and the Domain of Feasible Policy Alternatives in the American States. Paper presented at the annual meeting of the Western Political Science Association, San Francisco, CA.

Buck, S. J. (1991). Understanding Environmental Administration Law. Washington DC: Island Press.

Cibinic, Jr., J., & Nash Jr., R. C. (1998). Formation of Government Contracts. Washington, DC: George Washington University.

Conlan, T. J., Riggle, J. D., & Schwartz, D. E. (1995, Summer). Deregulating Federalism? The Politics of Mandate Reform in the 104th Congress. Publius: The Journal of Federalism 25, 23-40.

Cunningham, W. P., Cooper, T. H., Gorham, E., & Hepworth, M. T. (1998). Environmental Encyclopedia. Detroit, MI: Gale Research.

Dewitt, J. (1994). Civic Environmentalism: Alternatives to Regulation in States and Communities. Washington DC: CQ Press.

Profile of Innovative Technologies and Vendors for Waste Site Remediation. (1993). EPA Circular No. 542-R-94-002. Washington, DC: U.S. Government Printing Office

Federal Acquisition Regulation (FAR). (1999). CCH Business Law Editors. Washington DC: U.S. Government Printing Office.

Fort Ord Installation, Environmental Office, U.S. Army. (1991, September). The Army's Environmental Cleanup at Fort Ord (report). Washington, DC: U.S. Government Printing Office.

Fugh, J. L., Issacaon, S. P., & Rouse, L. E. (1990, May). The Commander and Environmental Compliance. The Army Lawyer.

General Accounting Office. (1992, December). Environmental Protection Issues. GAO/OCG-93-16TR. Washington, DC: U.S. Government Printing Office.

Goodman, S. W. (1994, May 17). Statement by the deputy under Secretary of Defense (Environmental Security) before the Senate Appropriations Committee Subcommittee on Defense. Washington, DC: U.S. Government Printing Office.

Gove, P. B. (1981). Cooper's Comprehensive Environmental Desk Reference. New York: Merril-Webster Inc.

Hager, G. (1990). Lobbyists: For Industry and Opponents: A Showdown is in the Air, Environment '90: The Legislative Agenda. Washington DC: CQ Press.

Hedge, D. M., Scicchitano, M. J., & Metz, P. (1991, December). The Principal-Agent Model and Regulatory Federalism. Western Political Quarterly, 44, 1055-1080.

Hoban, T. M., & Brooks, R. O. (1987). Green Justice: The Environment and the Courts. Boulder, CO: Westview Press.

Hooks, A. (1998, March/April). Implementing a Paperless Contracting Process. Army RD&A, 51-53.

Kendal, J. The Impact of the Congressional Budget Process on Environmental Policy in the 104th Congress. (1996, March). Paper presented at the annual meeting of the Western Political Science Association, San Francisco, CA.

Kraft, J. and Vig, C. (1996). Environmental Policy from the 1970s to the 1990s." Congressional Quarterly, Washington, DC: US Government Printing Office.

Kunkel, K. (1992, December). Fiscal Oversight of Department of Defense Cleanup and Compliance Activity, fiscal years 1984-1993. Unpublished master's thesis, Naval Postgraduate School, Monterey, CA.

Lee, M. (1993, January). Summaries of Environmental Laws Administered by Environmental Protection Agency. CRS Report for Congress, 93-53 ENR. Congressional Research Service. Washington, DC: The Library of Congress.

Lester, J. P. (1994). A New Federalism? Environmental Policy in the States. In N. J. Vig & M. E. Kraft (Eds.), Environmental Policy in the 1990s: Toward a New Agenda, 2nd ed., 51-53. Washington DC: CQ Press.

Lester, J. P., & Lombard, E. N. (1990, Spring). The Comparative Analysis of State Environmental Policy. Natural Resources Journal, 30, 30-31,

Lombardo, R. (1993, Winter/Spring). Dealing with Environmental Regulators. Naval Civil Engineer, 32(1): 28-30.

Manaster, K. A. (1994, May). Presentation of Environmental Regulations for the Monterey Peninsula. National Contract Management Association.

Pagano, M., and Bowman, A. The State of American Federalism, 1994-1995. Publius, The Journal of Federalism, 25 (Summer 1995), 19.

Paul Harvey. (1999, November 21). Radio broadcast.

Popoff, F. (1998). Dow Chemical Company publication, 4.

Profile of Innovative Technologies and Vendors for Waste Site Remediation. (1993, December). Environmental Protection Agency Circular Number 542-R-94-002. Washington, DC: U.S. Government Printing Office.

President Extends Right-to-Know and Pollution Prevention Laws to Federal Facilities. (1993, August). The Government Contractor.

President Clinton Issues Order Governing Federal Acquisition and Recycling. (1993, October). The Government Contractor.

Ringquist, J. (1993). Environmental Protection at the State Level (pamphlet), 43-60. Armonk, NY: M. E. Sharpe.

Rosenbaum, W. A. (1991). Environmental Politics and Policy, 2nd edition. Washington DC: CQ Press.

Sacarello, H.L.A. (1994). The Comprehensive Handbook of Hazardous Materials: Regulations, Handling, Monitoring and Safety. Boca Raton, FL: Lewis Publishers.

Schumacher, A. (1988). A Guide to Hazardous Materials Management. New York: Quorum Brooks.

Shulman, S. (1992). The Threat at Home: Confronting the Toxic Legacy of the U.S. Military. Boston: Beacon Press.

Smith, J. M. (1997, June). Environmental Federalism and U.S. Military Installations: A Framework for Compliance, Institute for National Security Studies. Boulder, CO: U.S. Air Force Academy.

Standard & Poor's Industry Surveys. (1998). Environmental & Waste Management. New York: Division of the McGraw-Hill Companies.

Standard & Poor's Register of Corporations. (1998). Directors and Executives. Washington, DC.

Suthersan, S. S. (1997). Remediation Engineering, Design Concepts. Boca Raton, FL: CRC Press.

Thomas, R. D. (1976). Intergovernmental Coordination and the Implementation of National Air and Water Pollution Policies. In C. O. Jones & R. D. Thomas (Eds.). Public Policy Making in a Federal System (pp. 129-187). Beverly Hills, CA: Sage Publications.

Wilson, W. G., Saserville, D. R. (1998). Sustaining Environmental Management Success. John Wiley & Sons.

United States Army Corps of Engineers. (1993, September). Management Plan Total Environmental Restoration Contracts (TERC). Huntsville, AL: Army Corps of Engineers.

United States Army Corps of Engineers. (1999, April). PARC Notes vol. 99(1).

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